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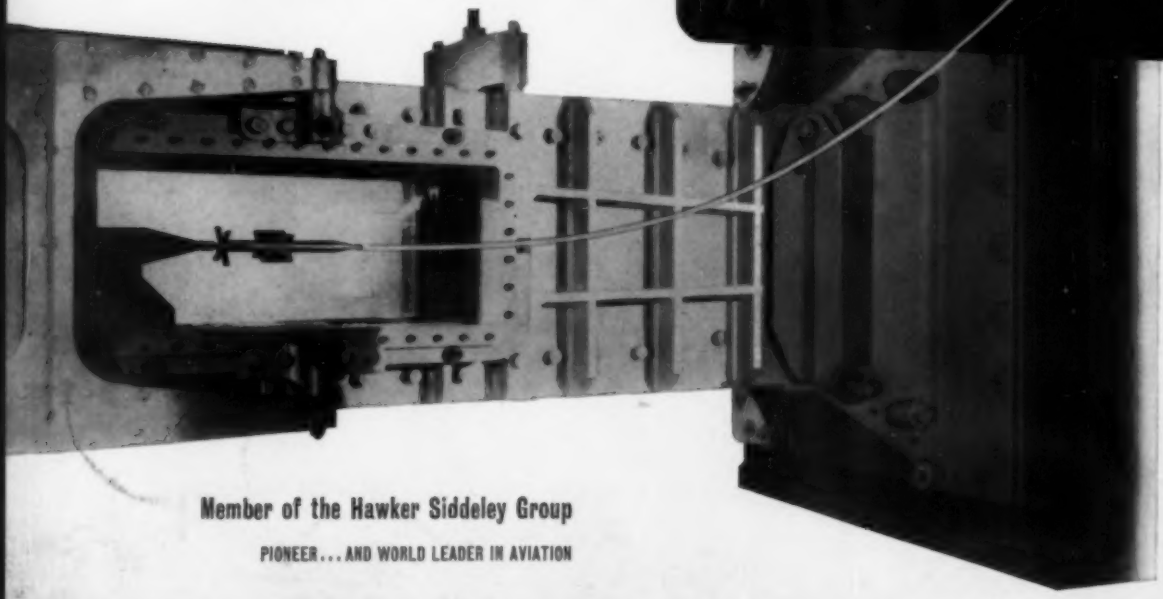

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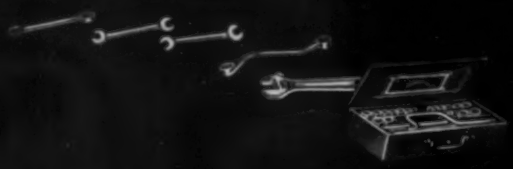

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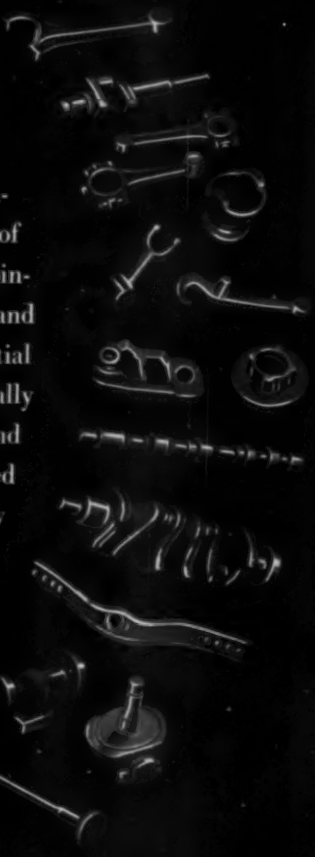

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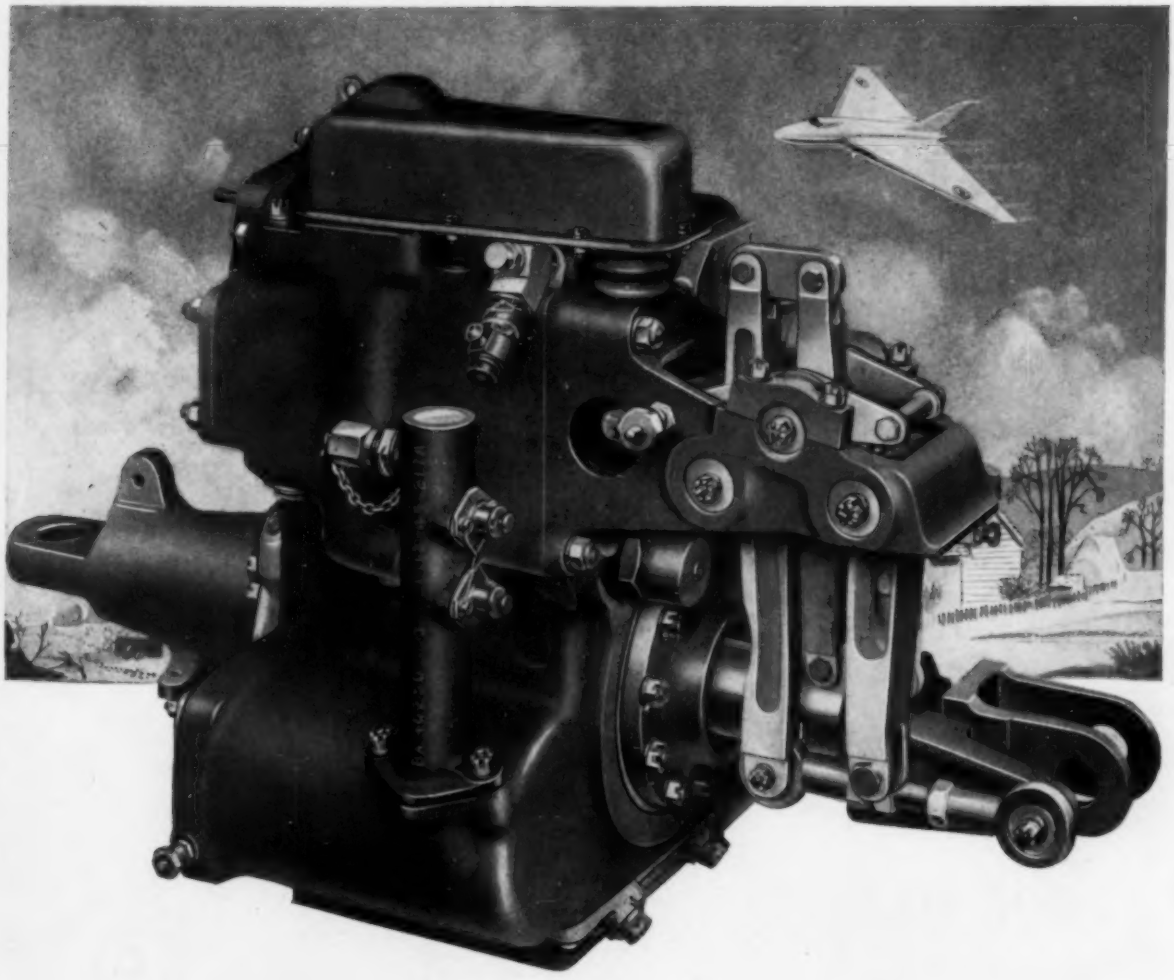

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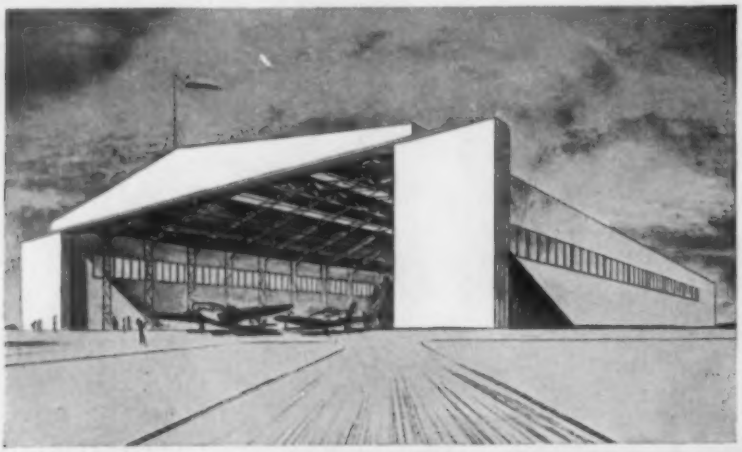

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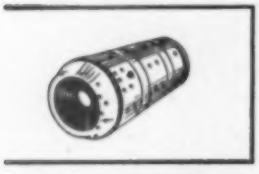

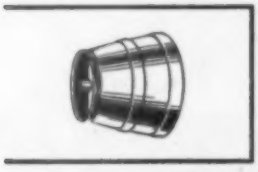

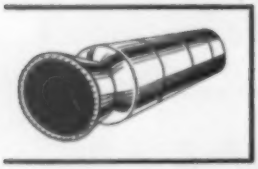

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and
AIRCRAFT ENGINEER

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Turbines and Rotors

JUST as the Anglo-Saxon kingdom of Wessex provided a dynasty for the united English state, so in the Westland Wessex helicopter, just announced, an American airframe is to be united with a British engine. Such a West Country union, of course, has precedents, for both the Dragonfly and Whirlwind, which today afford mobility and sustenance to Britain's armed forces and serve with equal distinction in the devious ways of peace, are of the same line (as, for that matter, is the new Widgeon). But the Wessex has a special significance, for it combines notably efficient and thoroughly proven elements of the Sikorsky S-58 with the unique and extremely promising Napier Gazelle gas turbine. A 100 per cent British lightweight unit, running in a vertical attitude, the Gazelle has a current rating of some 1,300 h.p., a figure which should be raised through development at least to the 1,600 h.p. already commanded by the S-58 from its American piston engine.

The original S-58 was designed specifically for anti-submarine work and its anglicized version is to be the standard "A.S." helicopter of the Royal Navy. Meanwhile, its twelve-passenger capacity and essential robustness and simplicity guarantee it a leading place in the transport field also, so Westland's match-making proclivities appear to have been exercised with customary shrewdness.

As for Napiers, their pioneer thinking and fine engineering can now be seen to have assured them of a very strong position in the helicopter business, for not only is the Gazelle to be standardized for the Naval S-58, but it is earmarked for at least one version of the twin-rotor Bristol. Moreover, the Eland, incorporating auxiliary compressors for a tip-powered rotor-system, is the chosen powerplant for the two Fairey Rotodynes now on the stocks.

Even brighter would have been the prospects from Acton had the Ministry of Supply not found it necessary to cancel the Hunting Percival project, utilizing Oryx gas generators.

To conclude these remarks we had intended to express the view that Napier's elegant family of helicopter turbines bids fair to establish itself overseas; but even as we wrote came confirmation that the engines are creating widespread interest in North America, where representatives of the company are now on tour discussing with Government departments and aircraft and engine makers several possible applications. News fully as heartening as is the prospect for the Eland-Convair conversion programme which we lately applauded.

Of Terrors, Storms and Devils

IN 1951 we let our fancy take wing in this column and conjured with aircraft names, being firmly of the view that a Service machine should be named as soon as ordered into production.

Having now turned up the page, and being quite overcome to find that we proposed "Hunter" to designate the new Hawker prototype of the day, we are encouraged to chance our arm at the popular new pastime of finding a name for the Hunter's successor, the English Electric P.1.

An early favourite—"Arrow"—we insinuated into the title of a recent picture-feature in the sneaking hope (we now confess) that someone might thereupon acclaim it as the perfect appellation. To our eventual relief, however, nothing of the kind transpired, for further reflection persuaded us towards something a shade less restrained. "Terror," we resolved, would do nicely, and we have since decided that there is much to be said for "English Electric Storm" (though "Supermarine Storm," for the N.113, seems an equally apt association).

As for the D.H.110, we harbour no lingering doubt. Its shape and purpose mark it incontrovertibly as the Sea Devil.

FROM ALL QUARTERS

P.1 Flies with Reheat

SPEAKING at the annual general meeting of the English Electric Co., Ltd., on March 15th, Sir George H. Nelson, Bt., chairman and managing director, said that the first prototype P.1 fighter recently flew for the first time with reheat, and that it would be flying at "still higher speeds" during the current trials. Company pilots who had flown the aircraft reported that it had no vices and was very pleasant indeed to fly. Though steady and encouraging progress was being made, the company did not underestimate the extent of the future development work needed to prove both the aircraft and its advanced equipment. The two P.1 prototypes, said Sir George, had now completed some 300 flights, most of which had been supersonic. Further P.1s would be flying later this year and good progress was being made with the twenty development aircraft. The P.1 had already been flown many times by Service pilots.

In the guided weapons field very promising test results were being achieved on ranges in this country and Australia. Provision of new facilities continued and the greater part of the new factory at Stevenage was now in operation.

Speaking of the subaidiary company D. Napier and Son, Ltd., Sir George said that this company was now in a position to deliver Elands from the factory in Liverpool.

Bristolians with Boeing

A TEAM of engineers from Bristol Aero Engines, Ltd., left London Airport last Friday for the U.S.A., where they are to discuss with the Boeing Airplane Co. the possible use of the Bristol Olympus turbojet as a powerplant for the Boeing 707. Talks began in Seattle last Monday. The team, which is led by Dr. E. J. Warlow-Davies, deputy chief engineer, comprises Mr. F. C. Marchant, who is the chief designer; Mr. Borden Lewis, assistant chief aerodynamicist; Mr. A. V. M. Reed, performance engineer; and W/C. Walter Gibb, assistant chief test pilot. The visit is being made at the invitation of Mr. Welwood Beall, senior vice-president of the Boeing company, who visited Bristol recently to discuss the Olympus engine.

Philippines Visit by Canberras

CANBERRAS of No. 9 Squadron, R.A.F. Bomber Command, are to pay a goodwill visit to Manila, in the Philippines, between April 12th and 16th, landing at the U.S.A.F. base at Clark Field. On March 15th the first group, led by S/L. L. G. Bastard, the C.O., left R.A.F. Binbrook for a three months' anti-bandit tour in Malaya. They are relieving No. 12 Squadron and fly to new temporary headquarters at R.A.F. Butterworth (Penang), via Idris, Habbaniya, Mauripur, Negombo and Changi. While at Penang a flight will go to Manila for the four-day visit.

EXPERIMENTAL SEA VENOM: A revealing photograph of a de Havilland Sea Venom F.A.W. 21 which has been fitted with blown inner flaps by the company's Christchurch division. It is at present engaged in experimental flying at high lift-coefficients.

One of the oldest squadrons in the R.A.F., No. 9 returned to England on February 24th after an 18,000-mile tour of West Africa, giving to many thousands of West Africans their first sight of a modern jet. Several ceremonial fly-pasts and displays were undertaken during the visit to Nigeria by H.M. the Queen and the Duke of Edinburgh.

Sea Hawks for German Navy

ACCORDING to the press bulletin of the German Aircraft Industry Association, a number of Hawker Sea Hawks are being ordered for the equipment of the West German Navy. A number of Fairey Gannets may also be obtained. Orders so far placed, excluding spares, are stated to be worth around five million pounds.

NATO limitations restrict the German Navy to 58 front-line aircraft. Except for a few Grumman Albatross air/sea rescue aircraft, the bulk of the equipment is expected to be obtained from England.

Wessex and Whirlwind

THE licensing agreement between Westland Aircraft, Ltd., and the Sikorsky Division of the United Aircraft Corporation of America has recently been extended with a view to the production of a new helicopter based on the engineering principles of the S-58 but redesigned to meet British operational requirements and standards of airworthiness. To be called the Wessex, it will be powered by the British-designed-and-built Napier Gazelle gas turbine. In anticipation of production Westlands have recently expanded their Yeovil works. A new technical building, including a comprehensive modern design and drawing office, has been erected and substantial extensions, involving a completely new layout, have been made to the machine shops. Additional factory space has been provided for production facilities.

Editorial comment on the Wessex appears in this issue.

From Yeovil, too, it is learned that delivery of the first troop-carrying helicopters to the British Army will begin in May. They will be Whirlwinds capable of carrying up to ten fully equipped troops, and are expected to be used initially at the Joint Experimental Unit, Middle Wallop. The Secretary of State for War has already announced that this Unit is to participate in field trials with the British Army in Germany during August this year.

Sycamores in the Middle East

ACCOMPANIED by Mr. D. Vicary, a service engineer, Bristol helicopter test pilot Peter Wilson has completed a 10,000-mile tour of Middle East units equipped with Sycamore helicopters.

Object of the tour, which lasted five weeks and involved about 70 hours flying, was to offer help and advice on servicing and operating questions to the Sycamore units of the Middle East Air Force. Wilson and Vicary spent a week in Cyprus, where four Sycamores are engaged in search/rescue, casualty evacuation and V.I.P. transport, and in supporting Commando operations in mountain areas. The Governor of Cyprus, Sir John Harding, is a frequent Sycamore passenger, and Air Marshal Sir Claude Pelly, C-in-C. of the Middle East Air Force, is flown daily from his home in Kyrenia to Nicosia. The journey—16 miles by road—is completed in fifteen minutes and without the need of an escort. In Nairobi, Kenya, a Sycamore is being used for "cas. evac." and is operating up to heights of 10,000ft in Mau Mau country. Mr. Wilson reports: "At least twelve soldiers in Kenya owe their lives to the Sycamore. It rescued them from situations in which other transport methods were impossible."

The Bristol visitors also landed at an airstrip 6,400ft above sea level, near Aden, where two Sycamores are based for sea and desert rescue duties. At Amman, on the return journey, Mr. Wilson had the unusual experience of flying a Sycamore at about 1,250ft below sea level in the Dead Sea area.

Rolls-Royce Issue

ANNOUNCEMENT was made last week of an issue of 1,100,000 new £1 Ordinary shares by Rolls-Royce, Ltd., at 77s 6d each. They are offered to holders of the existing £6m Ordinary stock and 619,234 workers' 1955 10s units registered on February 20th on a £1 for £6 basis.

In a statement accompanying the offer, Lord Hives, the chairman, said that turnover for 1956 should be nearly 30 per cent greater than three years ago; firm orders exceeded £70m. A statement was also made by Mr. W. T. Gill, finance director, who outlined current and impending moves in equipping the aero-engine division for programmes of high-speed and high-altitude research. Mr. Gill also mentioned production of the Conway and of the Tyne—the latter for the Vickers Vanguard, which would be coming into production in 1959.

GETTING THE RECORD

Background to the 1,132 m.p.h. Story

At a pressure-altitude of almost exactly 38,000ft Peter Twiss brings the F.D.2 up to the main ground station at Ford marking the eastern end of the course. The contrail reveals a small change in heading to line up before entering the approach gate.

THE achievement of a world speed record always reflects a long period of team-work, and this is particularly true of the great achievement by Peter Twiss and the Fairey Delta 2. Fairey Aviation began to scratch at the fast-delta problem at the end of World War 2. Early work was aimed at vertical take-off applications, as a backward glance at the F.D.1 (or E.10/47) emphasizes. In the F.D.2, however, the company have something which clearly could lead to a very effective "conventional" fighter.

This rakish machine was designed and developed by a team led by Mr. R. L. Lickley, Fairey chief engineer, under M.o.S. contract; and Mr. G. W. Hall, Fairey's assistant managing director, recently said that Mr. E. T. Jones, P.D.S.R.(A.), of the Ministry, had given "constant help and encouragement from the inception." Chief designer, of course, is Mr. H. E. Chaplin, for whom the record came as a 60th-birthday present. Many of the best features of the F.D.2 are his, including the nose (which droops hydraulically through 10 deg and so solves the problem of low drag coupled with good pilot view on the approach) and the stowage of the main undercarriage units in what must be the thinnest aircraft wing yet made in Britain.

As head of the technical department, Dr. H. F. Winny had to supervise flutter and other calculations in realms never before explored, and he also assumed responsibility for the F.D.2's airworthiness. Getting drawings out on schedule, in the face of a mounting load of other work, was the task of Mr. E. Norris, D.O. superintendent. The brunt of the detail design fell on D. Wakeford, assisted by A. A. Puttick; J. W. Young was chief stressman, and G. Selwood, chief designer (hydraulics) looked after the Fairey powered-control system. The construction of the prototypes (WG 774 flew on October 7th, 1954, and WG 777 on February 15th, 1956) was under the jurisdiction of Mr. F. Parker, engineering manager; and the standard of manufacture is shown by the fact that complete interchangeability of wings has been achieved (WG 774 had a wing-change) and that the second machine is identical to the first in aerodynamics and performance. Flight trials were planned by Mr. M. Child, chief flight-development engineer, and the company's chief test pilot is G/C. Gordon Slade—who, although he did much of the flying on the F.D.1, decided that his assistant, Peter Twiss, had a decided flair for the F.D.2, and consequently stood down in the latter's favour.

Initial F.D.2 work came to fruition in 1950-1, based on a Rolls-Royce Avon turbojet with afterburner. The first concept of the aircraft was that it should be a transonic research machine, but it was deliberately given the thinnest possible wing for possible exploration beyond the "sonic barrier." To a great extent the company were working in the dark, and tunnel hours went into four figures before the shape was finalized. Particularly heavy design-loads were imposed by the undercarriage stowage (solved by employing a sophisticated design in very-high-tensile steel), the provision of duplicated powered controls (without manual reversion), the necessity to employ very thick skins and heavy forgings, and the need to carry fuel in the razor-like wing (which, in fact, has yet to show a leak).

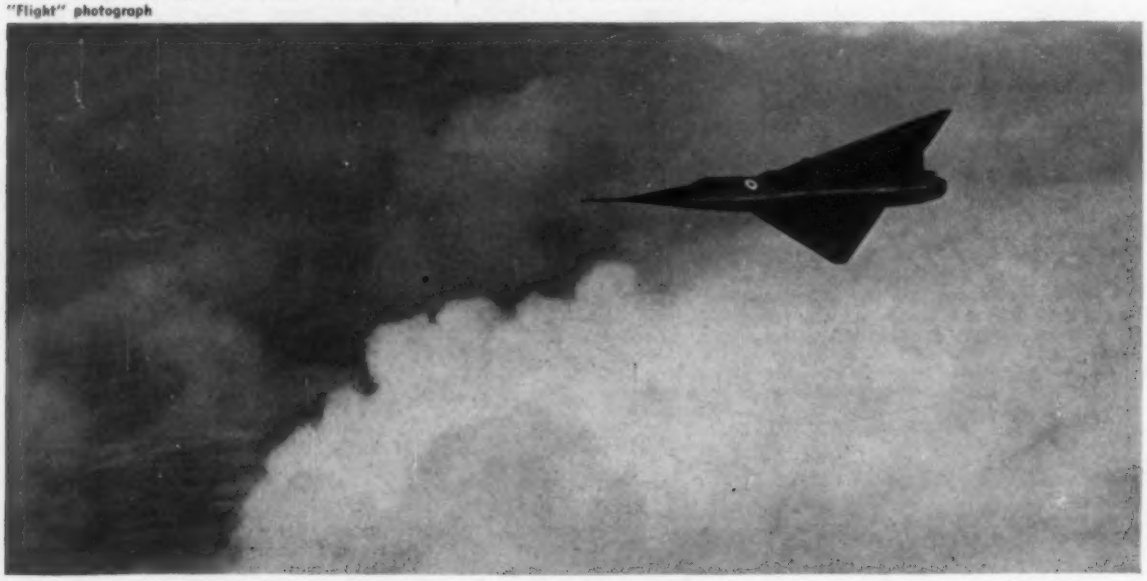
Over 110 flights have been made by the F.D.2 (almost all of these being on the first machine), the flight time being about 50 hours. All the early flying was subsonic, but Mach 1 was passed last October and over 50 flights involving supersonic speed have now been made, the supersonic time exceeding six hours. Once WG 774 had gone supersonic the company were certain that it could reach a four-figure speed; and the idea of going for the record crystallized about the middle of November, when the aircraft had done Mach 1.56.

One of the first essentials was a study of the F.A.I. rules under which all such records must be made. A rigorous requirement is the stipulation that the pilot may not lose more than 100 metres (328ft) over the course, this being measured from a datum at an entrance "gate." Even more difficult is the requirement that the succeeding run (in the opposite direction) must be started through a 100-metre gate at an altitude fixed by the previous run. Until the completion of the final run the aircraft is also not allowed at any point to gain more than 750 metres from the mean of the first two runs.

As the first prototype F.D.2 was based at the A. and A.E.E., Boscombe Down, it was decided to lay out a course over Sussex, between Chichester and R.N.A.S. Ford (H.M.S. *Peregrine*). The height for the runs was fixed at 38,000ft, since this not only approximated to the level for optimum performance* but also was

* *In earlier records with Mach-limited (subsonic) aircraft it was necessary to choose a hot day to reduce the Mach number appropriate to a given airspeed. With the F.D.2 the coldest atmosphere was required, to increase the thrust.*

"Flight" photograph



Fairey were delighted with the performance of the Rolls-Royce afterburning Avon—notwithstanding the treatment meted out at Boscombe Down by G/C. Slade and Peter Twiss to Harry Shaw, the R-R service rep.

GETTING THE RECORD . . .

likely to ensure a good contrail—an essential aid to ground tracking. For the latter purpose artificial smoke generation was tried and found to be inadequate, since smoke for 30 seconds spreads very thinly at 1,000 m.p.h.

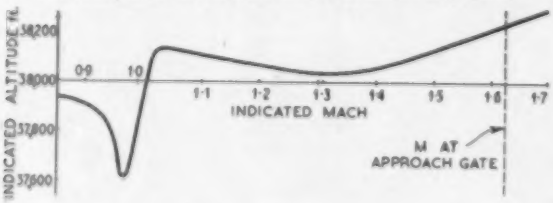
Ground sites were established near Chichester and adjacent to the Ford sick-bay, and extensive telephone services were set up, with G.P.O. help, plugging straight in to the lines laid for a disused 1944 airfield. Chichester Corporation and the Ordnance Survey assisted in surveying the sites, 9.67 miles apart, and the G.P.O. laid down two independent timing circuits joining the station at Chichester to the master site at Ford. Two complete installations of the most advanced Army radar were brought in, and additional radio equipment was set up until complete integration was possible between both stations, the aircraft and Boscombe.

The measuring procedure adopted was based on a telescope/camera unit at each station (broadly similar to the equipment used for Col. Hanes' F-100C record), most of the equipment having been developed at the R.A.E. Instrument Section. Each camera was mounted vertically (the axes were not radii of the earth but were parallel to each other) and arranged to pivot only about an axis in line with the course (i.e. each camera could swing north or south of the desired track). Associated with each camera was a telescope arranged to pivot about an axis perpendicular to the course (i.e., each telescope could follow the aircraft on its easterly or westerly run). An operator would pick up the contrail at a very low elevation, and follow it round until, at the 90-deg point overhead, the telescope triggered a switch which caused the camera to take a photograph of the aircraft and also started the electronic timing system. At the same time, the F.D.2 was fitted with a pair of trace recorders which—started just before take-off—left a plot of altitude, i.a.s. and temperature. Their traces, however, had to be subjected to laborious reduction before the critical figures (of height at the gates, for example) could be found.

Late last year there were no British data on the variation of position error in an aircraft static system at Mach numbers over about 1.2, the latter having been found in steeply diving Hunters of the R.A.E. Accordingly, Peter Twiss had to produce precise calibration for the F.D.2, and the lower curve on this page shows that it is as well that he did. The method used was the hair-raising procedure of flying past a calibrated Venom at exact levels of altitude and airspeed; the Venom was kept at M=0.75, and Twiss's final runs overtook it with a margin of about sonic speed, after having accelerated from some 20 miles behind it. Extraordinary control by Fighter Command and co-operation between the pilots enabled the curve to be drawn accurately, after eight flights.

Fighter Command were also heavily engaged in other fields. Under the code name Exercise Metrical a bulky file was opened—and, as it was marked Secret, the 400 people involved kept the programme under their hats. Not only was the F.D.2 recognized as a fine target for fighter control, but Meteors from 29 Squadron (Tangmere) went up each day to assess contrail height, calibrate the radar and check the communication systems.

A curve showing the altimeter reading which had to be set on the F.D.2 in order to fly truly level at 38,000ft. The method by which this curve was plotted is described in the text immediately above.

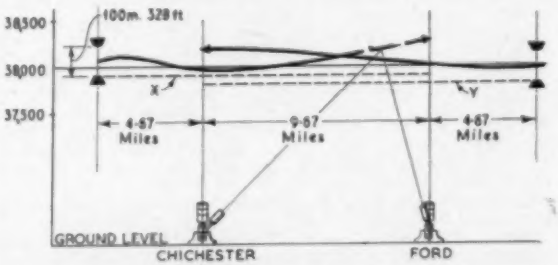


By Thursday, March 8th, everything was ready. Before take-off a precise check was made of the pitot-static system, ensuring that no leak occurred in a 3½-min period. Then, after starting the airborne recorders, Twiss took off on a westerly course and climbed in a wide sweep to port over the New Forest, following a flight plan carefully chosen to make the best use of the fuel.

At a point A some five miles short of Fawley refinery the afterburner was brought in, and acceleration was continuous from here until the end of the run. The F.D.2 is very smooth "through the barrier," and Twiss had to watch his instruments closely to see the tell-tale flick of some 500ft on the altimeter as the shock moved past the static slots at Mach 1. He then had to keep to 38,000ft true pressure-height (red lines on the altimeter helped) by following the curve already mentioned.

Distances to the first gate B were passed by radio from the radar sites, while the contrail—doubled in strength by the use of afterburning—was picked up by the telescope at C (Chichester ground-station, at the beginning of the course proper). Slight jinking, up to about 5-deg change in heading, was necessary to maintain a correct flight path as the heading photograph shows. From B to C took roughly 15 seconds and the course itself, from C to D, about 31 seconds. Then reheat was cancelled and a wide turn made out to sea.

To bring the aircraft back over Beachy Head the whole procedure was repeated in a westerly direction, ensuring that the height at gate E was within 328ft of that on the first run. Finally,



Geometry of the course, showing the ground sites and the two approach "gates." X and Y are the lower limits for the first and second runs, respectively; the height-separation actually achieved was only 98ft.

a minimum-power let-down was made, to a landing at Boscombe after about 24 minutes in the air. The triple braking parachutes were not necessary, on the great A. and A.E.E. runway.

Meanwhile, those on the ground had been severely exercised in attempting to follow the speeding contrail. The camera operator had to work a 3in handwheel at a speed which exceeded one turn per second at the 90-deg point. On most runs the camera was late and it was found very difficult to get really good pictures. Settings had been worked out to put the cameras on-target in the absence of a trail, but experience showed that under these conditions the cameras would not have had a chance. Nevertheless, the aircraft was normally aligned within a mile or so of the true track.

In addition to those pictured on page 315 there were several well-known personalities at the ground stations. The official R.Ae.C. observer at the master station at Ford was Major R. H. Mayo, with Hubert Broad at Chichester. Philip Mayne and Maurice Imray were time-keeping at Boscombe and checking the removal of the traces from the airborne recorders.

Results were not analysed within 24 hr, so the aircraft was refuelled, fitted with refilled recorders, leak-tested and flown off again, all in a time of some 1¼ hr. Twiss really worked hard over the record, and flew eight runs on the Thursday, Friday and Saturday; yet it was the final flight, starting at 11.21 a.m. on the Saturday (March 10th) which yielded the best results. These were (unconfirmed) speeds of 1,117 and 1,147 m.p.h. on the two runs, giving a mean of 1,132 m.p.h. (M = 1.731 and 550 kt i.a.s.).

We saw one of the actual traces from the airborne recorder, and were deeply impressed by the fact that the air-speed trace showed a steady increase in speed right through the measured course C-D, to reach a maximum at the point beyond D where reheat was cancelled. If a way could be found either to accelerate more rapidly or to carry fuel there is no doubt that the same team could beat their own record handsomely.

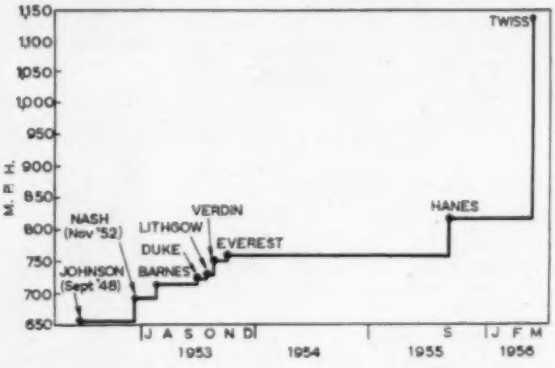
A study in concentration during the actual record runs: on the left are seen Mr. C. O. Clarke, Fairey chief radio engineer; G/C Gordon Slade, chief test pilot; Mr. J. J. Hilliard, Fairey engineer in charge of both sites and Mr. J. Wilson flight-development engineer; the last named is also visible in the background to the right-hand photograph, in which Mr. W. J. G. Cox, the senior member of the team of technicians from the R.A.E., is engaged in tracking the approaching aircraft with one of the camera/telescope units.

GETTING THE RECORD . . .

Contributors to the Record included the following: Accles and Pollock; Accurate Tools; Aerocomponents; Aero Research; Amalgamated Dental; George Angus; Atlas Plating; Ault and Wiberg; Automotive Products; Aviation Developments; Avica Equipment; Barnet Instruments; B.B. Chemicals; Bell's Asbestos; Besson and Robinson; B. I. Callender's Cables; Bowden Tools; British Electrical Resistance; British Ropes; British Timken; Brown Bayley Steels; Burgess Products; Calvern; Cinetra Manufacturing.

P. B. Cow; Dowty Equipment; Dunlop; Egerton Tools; Enfield Tool Manufacturing; Evans and Sons; Fairey Aviation; Flight Refuelling; Gloster Aircraft; Sir George Godfrey and Partners; G. Q. Parachutes; Graviner Manufacturing; Guy Calculating Machines; Hall and Hall; Heathway Engineering; High Duty Alloys; Hoffmann Manufacturing; H.T.B.; The Hughes-Johnson Stampings; Hymatic Engineering; George Kent; King Aircraft; Kingston Instruments; Lockheed Hydraulic Brakes.

Manganese Bronze and Brass; Marston Excelsior; Martin Baker Aircraft; Minnesota Mining and Manufacturing; Model Engineering; Morton and Steer; Nash and Thompson; Normalair; Northern Aluminium; Novogage; The Palmer Tyre; Oliver Pell; W. Platt; Plessey; Pye; Redwing; R.F.D.; Rolls-Royce; Rotax; Rotol; Saunders Valves; Seaton Creaghe; Skefco Ball Bearings; Smiths Aircraft Instruments; S.P.E.; Sterling Metals; Teddington Aircraft Controls; Teleflex Products; Toolpro; Tufnol; Triplex Safety Glass; Ultra Electric; Vandervell Products; Venner Accumulators; Vickers-Armstrongs; James Walker; Western Manufacturing (Reading); Westinghouse Brake; Westley Smith; Weybridge Machine Control; Wills Pressurefilled Rings.



The greatness of Twiss's achievement is vividly brought out in this diagram; which, nevertheless, does not give a true picture owing to the compression of the horizontal scale at the left-hand end. Assuming a figure of 1,132 m.p.h., the new record is 37 per cent greater than that set by Colonel Hanes. (Note: letters on the "x-axis" indicate months.)

WESTON'S FIRST SYCAMORE

WEDNESDAY, March 14th, was an important day for the Bristol Aircraft Company in general and for its helicopter division in particular, for it was on that date that the first helicopter built at the Company's Oldmixon works at Weston-super-Mare was publicly demonstrated for the first time, before a gathering that included the Mayor of Weston-super-Mare, Councillor R. Ivens, and members of the council.

A strong, cold east wind was blowing determinedly as the spectators gathered on the tarmac, and at noon precisely the demonstration machine—a standard Service-type Mk 4—climbed away under the control of Mr. "Sox" Hosegood, flying from the right-hand seat with Mr. P. G. Masefield on his left. Conditions were, of course, favourable for a helicopter demonstration, but none the less the Sycamore's vertical climb at 1,200ft/min or so to some 700-800ft was extremely impressive: and Mr. Hosegood's tricks and turns and final high-speed pass i.a.s., 110 kt) left nothing to be desired. After the demonstration the Mayor and other dignitaries were taken for a short flight —this time by Mr. J. I. Williamson—to survey their domain.

Bristol's Weston works were built in the early days of the war for "shadow" production of Beaufighters, the first of which was rolled out in the spring of 1941. By the end of the war, some 3,300 aircraft had been delivered, production at the peak times reaching as high as 25 machines per week. In 1945, the line was turned over, with scarcely a break, to the construction of aluminium bungalows, of which 11,250 were built; later, other prefabricated buildings were made, thus keeping in being a corps of skilled workers in the neighbourhood, with the hope that one day the works might revert to the building of aircraft.

This hope has now been realized—partly to make more space for Britannia production at Filton, and partly to concentrate and expand the work of the entire helicopter division in one place. The Weston works have already taken over full responsibility for Sycamore manufacture: transfer of work on twin-engined twin-rotor helicopters for military and civil application is in progress, and should be complete by the end of the year, as should be the transfer of the design staff, now inconveniently housed some distance away from Filton. All helicopter production testing and development flying will also be carried out from Weston under the guidance of Mr. Hosegood.

The Mayor of Weston and civic officials with Bristol executives. Extreme left is the Town Clerk of Weston, Mr. R. G. Lickfold; fourth from left (in light overcoat) is Mr. W. Strachan, Weston works director, with the Mayor next to him. Mr. Peter Masefield, managing director of Bristol Aircraft, is in the centre, with Mr. C. T. D. Hosegood (chief helicopter test pilot) on his left.

***WILLING AND ABLE** to undertake general charter work and air photography in Sweden is this Auster Cirrus-Autocar floatplane of Stockholms Aero. It is a worthy member of the "web-footed fraternity" which we featured in photographs last week.*

HERE AND THERE

The Duke at Brough

ON April 6th H.R.H. the Duke of Edinburgh is to visit the Blackburn and General Aircraft works at Brough. Final arrangements were not being made until after the Duke's Mediterranean holiday with the Queen, but it is thought likely that he will have a flight in a Beverley and be invited to handle it.

Cairo Record Confirmed

THE F.A.I. has confirmed the London-Cairo record made by a Canberra B.8 (Peter Hillwood and D. A. Watson) on February 16th. The time was 3 hr 57 min 18.2 sec, a speed of 888.054 km/hr (551.8 m.p.h.).

Olympic Odyssey

TWO Australian pilots, Mr. Frank Murphy and Mr. David Maclure, left Croydon last week on a flight to Australia in a Proctor equipped with an extra fuel tank giving a total range of about 700 miles. They intend to complete the journey—during which they will publicize the Melbourne Olympic Games—in 41 stages.

Canberra Navigation Exercises

SIX navigation training exercises for students of the current Specialist Navigation Course will be carried out between Strubby, Lincs, and Luqa, Malta, by Canberras of the R.A.F. Flying College, Manby, Lincs., this month. Two return flights will be made daily, on March 26th, 27th and 28th, between Strubby and Luqa. A. Cdre. G. A. Walker, Commandant of the College, will captain and pilot a Canberra to and from Luqa on March 27th. Altogether, twenty staff and specialist navigation students will man the aircraft on the various flights. G/C. J. R. A. Embling, chief instructor of the College, will also take part in the exercise as captain and pilot of one of the bombers. Among future flights planned by the College are its tenth air expedition to the North Pole, to be carried out in June by four Lincolns.

***VAN DRIVERS:** Known in Russia as the Flying Van or Flying Boxcar (and in the Allied Services by the code-name Horse), the twin-rotor helicopter seen here in model form has lately secured two payload records. Taking off from Tushino, G. A. Tinyakov (left) took a load of two metric tons to a height of 5,082 metres, and E. F. Milyutichev (right) ascended to over 2,000 metres with four tons. The helicopter was designed by Hero of Socialist Labour A. S. Yakovlev.*

Capt. Westervelt Dies

IT is reported from Florida that Captain George Westervelt, U.S.N. (Ret.), who played an important part in the design of the NC-4 flying boats, died on March 16th at the age of 75. The NC-4 boats made the first transatlantic crossing in May 1919. Captain Westervelt was in charge of all U.S. Navy aircraft construction during World War 1.

Wholesale Helicopter Order

THE French Armed Forces Technical Planning Committee announced in Paris last week its intention of ordering over 100 light and heavy helicopters for use in the disturbed Algerian areas. It is thought that orders are likely to be placed abroad. The Committee has also decided to set up a State-owned helicopter factory "as soon as possible."

Lifeboats and Helicopters

AT last week's annual general meeting of the Royal National Lifeboat Institution it was reported that helicopters had co-operated with lifeboats on 58 occasions last year, compared with 12 in 1954. A special sub-committee had reported that co-ordination arrangements were "adequate and satisfactory." The Institution understood that coverage of the coastline by Service helicopters was likely to be extended in the near future.

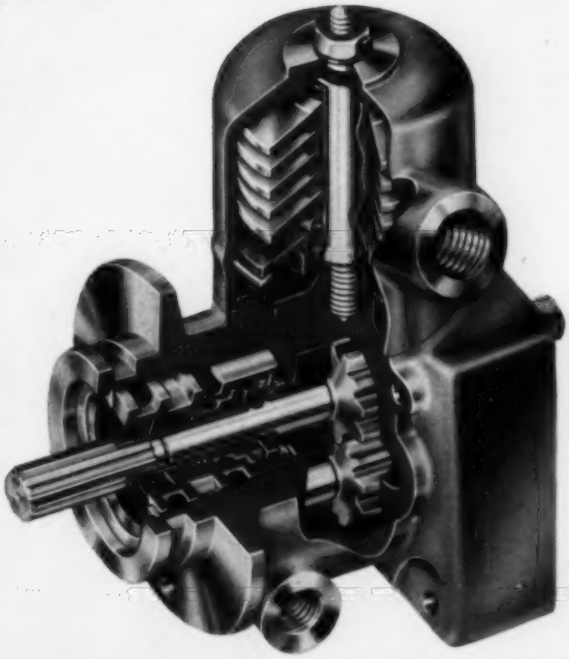
Vampire Trainer in Japan

TOKYO RADIO gave considerable publicity to "the first public trial of the Vampire Trainer recently purchased from de Havillands of Britain" by the Defence Board. The demonstration was given at Hamamatsu airfield on March 9th, with George Errington at the controls. This is believed to be the first British-built aircraft to be owned by the Japanese Self-defence Force. The same source also reported that the Board has ordered 97 T-33A jet trainers from the Kawasaki Company, and 70 Sabre fighters from Mitsubishi Heavy Industries.

***EXPERTS ABROAD:** This group, photographed recently in Washington consists of the technical staff of the British Joint Services Mission. Names in the group are as follows:* (Back Row) Dr. G. L. Hutchinson, Cdr. R. H. Webber, R.N., J. Watson, J. W. Gibson, H. G. Wenham, C. J. Francis, J. R. Todd. (Middle Row) Dr. C. G. Lawson, R. C. Tucker, Brigadier R. H. Ferrant, A. Cdre. L. R. S. Freestone, S. Scott-Hall, P. E. Pollard, F. G. R. Cook, A. Anthony. (Front Row) W/C. A. H. Gibb, F. Grinstead, L. F. Jones, T. M. B. Wright, N. K. Walker, J. Izzard, P. E. Bish.

aircraft pumps by Plessey

This is the main fuel pump for a small gas turbine. It is a positive displacement type, with a built-in filter and having a Duplex seal on the input shaft, with independently vented gland chamber to prevent any possibility of dilution of the engine oil with fuel. Pressure-loaded bearings ensure high volumetric efficiency under all operating conditions, not only when the pump is new, but also after prolonged service, because of the automatic adjustment for any slight wear that may take place. Special means of lubricating and cooling the bearings ensure that the pump is not liable to damage by dirty fuel. The particular unit illustrated provides a shaft drive for the fuel system governor which mounts directly on the pump end—and provides an outstanding example of the way in which Plessey will produce special pumps to meet any reasonable requirement.



BALANCED PRESSURE-LOADED BEARINGS

THE PLESSEY COMPANY LIMITED · ILFORD · ESSEX

A.63

Hydraulic Pump

This unit was the first aircraft hydraulic pump approved for 4,000 p.s.i. operation and has since served as the "heart" of the hydraulic systems in several aircraft. It is but one of over 60 different types of British Messier 4,000 p.s.i. hydraulic units fitted to the Bristol Britannia 100.

BRITISH MESSIER

GLOUCESTER · ENGLAND

PUB/BM/4/56

In this group, photographed during the author's recent visit to Germany, are (left to right, in forefront) Dr. Stern, Head of Technical Intelligence Division, British Embassy, Bonn; Lady Fedden; Dr. Ernst Heinkel; Sir Roy Fedden, Dr. Gunter, Heinkel chief engineer; Herr Heinkel, Jnr.; and Karl Schwärzler, Heinkel technical director.

Further Thoughts on Germany

By SIR ROY FEDDEN

THIS is another brief and to-the-point contribution by Sir Roy Fedden, M.B.E., D.Sc., Hon. F.R.Ae.S., M.I.Mech.E., F.R.S.A., M.I.A.S., M.S.A.E., whose career in aeronautical engineering, and particularly in engine design and development, has received international recognition. His previous article appeared in our pages on January 20th last.

SINCE my previous article on this subject I have made another trip to Germany. Shortly before I left, *Flight* published two articles on the proposed resuscitation of Germany's aviation industry [by Frank Ziegler, January 27th and February 3rd]. I think these are a matter for congratulation: they give a comprehensive and fair representation of the state of aviation there today, and of how it is proposed to produce the first phase of aircraft for Germany's NATO Air Force.

I discussed these articles with several aviation authorities in Germany, and noted the interest they aroused there—more, in fact, than I venture to think has been the case in this country.

The penultimate paragraph of the second article, in which it is stated that "The British attitude may help to delay the resurrection of the German aviation industry, but will hardly prevent it" is, I feel, the key to the situation. This, I was told, is fair comment on how the Powers-that-Be in Germany see the position of their aircraft rearmament *vis-à-vis* this country.

Broadly speaking, I suggest that the German industry, government officials, and our own authorities at Bonn consider that we are taking a somewhat pedantic and illogical point of view over this matter. It would be understandable if, after two world wars, the brunt of both of which we have taken, neither Britain nor British aircraft personalities wished to have contacts with Germany. This approach was, frankly, the correct and proper one which I was instructed to adopt in the full flush of complete victory, when I took my mission to Germany in 1945 on behalf of Sir Stafford Cripps; but there has been a profound change in international politics in the last ten years.

Germany has been accepted as a full member of NATO, and is to have an air force. She is still a virile nation, and one of the few countries which can be relied upon to put up a show if trouble comes from the East. Therefore, it would seem to the German authorities only logical that there should be a reconciliation with the British aircraft industry, and that we should be willing to let them have a quota of British Service aircraft if they want them.

It does seem extraordinary, and derogatory to British prestige, that the first phase of German rearmament should include Italian, French, and American aircraft, but, so far, no British machines. It is difficult to have a foreign type of aircraft selected by Germany without having some high-ranking technical representation taking part in the discussions, and there is little prospect of a machine being accepted, however good the sales effort may be, unless some senior member of the group responsible for creating the design goes there in person.

If we accept the ruling of our Government in regard to Germany's membership of NATO, and the re-establishment of an air force, it seems illogical that we should not have extended the olive branch more positively, and sent over senior technical people for discussions with German technicians. The Royal Aeronautical Society should send lecturers there, and we should have been adequately represented at the Augsburg Aeronautical Conference last October. As one well-known German said to me recently, "If we want Hunters, and you want us to have them, it is Sir Sydney Camm we want to see." This feeling dominates the situation in relation to Germany taking up British aircraft and engines, and should have been pushed at the highest level.

I do not think we can expect to have our equipment selected until we take more interest in the Germans' problems, and the efforts they are making to start up their industry again. We could well have invited one or two of their senior people over here to lecture, for we could benefit from the interesting information which they could give us relating to their last-war problems, and to the experiences of their technicians who have spent many years in Russia since the war.

The weather during this last trip was very severe—10 deg below zero—and the autobahnen icebound. It was interesting, therefore, to note that during the first week of February some 300 technicians were keen enough to assemble in the snows of the Black Forest at Freudenstadt, about 120 miles west of Munich, for a conference on rockets and guided missiles. There was an enthusiastic team of eighteen representatives there from France, a strong group from America, including some German technicians now working there, as well as certain Russian rocket specialists. As far as I know, there was no British official representation.

As regards guided missile development generally, I feel devoutly thankful that America is leading on this whole matter. Nevertheless, it would seem to me, from the deliberations of this conference, that the present lead of the U.S. is more in the nature of urgent practical development and the gathering together of very large staffs of technicians and elaborate equipment, but that nothing very spectacular has been achieved over and above the basic thinking of the Germans way back in 1945. I think we have got to hand it to the Germans as being the "king-pins" on this rocketry and guided-weapon technique. As far as one can gather, they apparently still have good ideas; and, seeing that we are both together in the NATO Air Defence Force, it might not be a bad scheme to co-opt some of their thinking into our practical efforts in this country.

It is important not to fall again into the fatal mistake of trying to attempt too much in rocketry, as we have done in post-war aircraft; and if we can make a combined European effort on a narrow concentrated basis with the most advanced thought possible, it might well lead to excellent practical results. Many of the senior German rocket technicians who are now available have, at any rate, been keeping their hands in by working for Russia for the last ten years.

This Freudenstadt meeting is to be followed by a more important conference which is sponsored by AGARD-NATO and is to be held next month in Munich, under the leadership of Professor von Karman. It is to take the form of a seminar on German development of rockets and guided missiles during the war, and from this will be promulgated ideas for the future. It should be a meeting of considerable consequence, and one hopes that in this instance Britain will be adequately represented.

R.Ae.S. ASSOCIATE EXAMINATIONS

THE Royal Aeronautical Society has issued the pass list for its Associate Fellowship examinations held last December, under both the old and the revised syllabus. Names of the successful candidates are as follows:—

Part I.—D. O. Challis, Tulsi Dass (India), D. W. Evans, A. Finaz, J. R. Lyon, A. A. Munday, Tilak Raj (India), J. C. Stanton, J. F. Teague (Australia), A. L. Webb, D. L. Wingate.

Part I (new syllabus).—F/O. J. M. Brant, V. Shridher Hedge (India), D. J. L. Lewis, G. S. Uppal (India), E. S. F. Wright.

Part II.—W. B. Blydenstein, M. Farmer, C. F. Forer, G. L. Hearne, K. G. Hodson, H. M. Israel (India), K. McQuade, M. E. A. Manning, V. Petsounis, J. Pickard, S/L. R. F. Plucknett, A. P. N. Potts, B. N. Vaman Rao (India), Miss P. M. Smith, A. B. Taylor, S. M. Turner.

AIR CAMERA FILMS STANDARDIZED

THE British Standards Institution has recently published B.S.2696: 1956, *Dimensions of Film for Airborne Cameras*. This standard, which supersedes the War Emergency B.S.1166: 1944 *Dimensions of Roll Films for Service Use*, relates to films for use in both Service- and civilian-type cameras.

The dimensions of roll films (up to 1,000ft in length) for survey and reconnaissance, training and assessment, and for duplicating air negatives are specified, and details of the cutting width and tolerances on nominal length, perforations and leaders and trailers are also given.

Copies of B.S.2696 may be obtained, price 3s 6d, from the Sales Branch, British Standards Institution, 2 Park Street, London, W.1.

An Oil Well at Sea

—is Served by Helicopters: Alan Bristow Describes Operations in the Persian Gulf

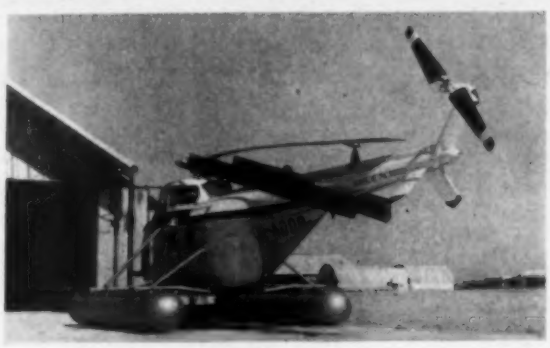
A PARTICULARLY interesting description of his company's current helicopter operations in the Persian Gulf was given by Mr. Alan Bristow at a recent meeting of the Helicopter Association and, to illustrate his lecture, he showed a colour film depicting certain aspects of the operations.

Two Westland Whirlwind helicopters were employed for the purpose, owned by Shell and operated on their behalf by Bristow Helicopters, Ltd. They were based on Doha, where a small heliport with hangar accommodation and a concrete apron had been built, and were used to carry passengers and freight between Doha and an oil-drilling rig located 50 miles out to sea. The helicopters made use of a specially constructed cantilever landing platform attached to the side of the rig's structure. Measuring 50ft × 70ft, it was about 50ft above water level.

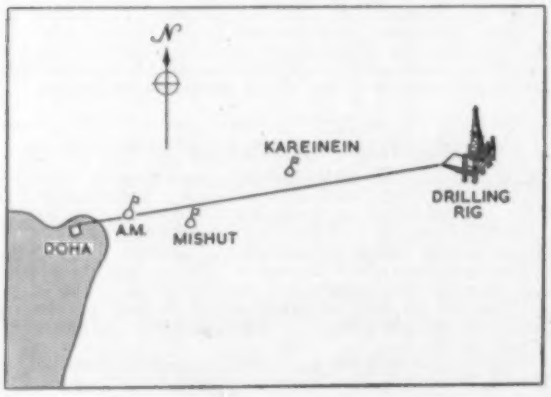
During certain seasons of the year the state of the sea was such that marine craft could not go alongside the rig. For example, in February nearly 80 per cent of the days precluded the use of small boats and the only link with the shore was by means of helicopter. The oil company suffered a loss of approximately £1,000 per day when the rig was not functioning normally, so the aircraft were playing a most important part in the progress of the drilling operations.

This was the first occasion on which British commercial helicopters had been engaged in regular flying in such extreme heat and high humidity, but they had been able to fly at an all-up weight of 7,200 lb without difficulty, giving a payload of a little over 1,320 lb. During the previous month they had carried over 300 passengers and 26,000 lb of freight out to the rig.

All passengers and crew wore life-jackets in flight and carried shark repellent, since the waters of the Gulf were heavily infested. An additional precaution was the use on each Whirlwind of permanently inflated pontoons in place of the wheeled undercarriage. This change involved a weight penalty of 25 lb, but by cutting down on the weight of other items of equipment which were not necessary, 244 lb had been saved. One significant reduction had been effected in the internal furnishing of the machines, which now consisted of lightweight Rumbold seats which, for eight passengers, weighed only 83 lb.



These photographs show, starting at top left, the complete rig—derrick, platform and piles—being transported on barges to its site (note the helicopter on deck); the flight deck under construction; one of the Whirlwinds on its handling trolley at the Doha base; and the other aircraft making a trial touchdown on the flight deck before the rig had been towed out to sea. (left) Buoys mark the 50-mile ferry route; the first, unnamed when operations began, is known as "Able Marker."

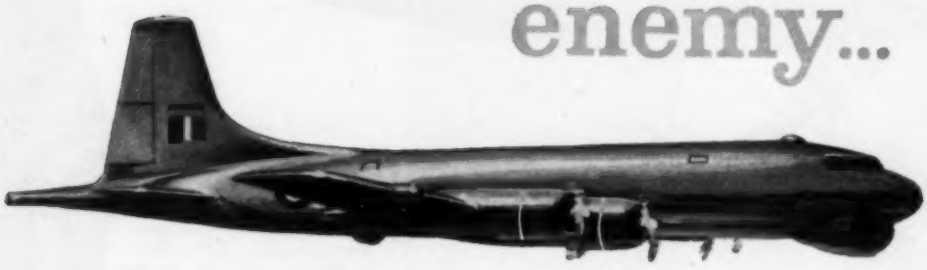


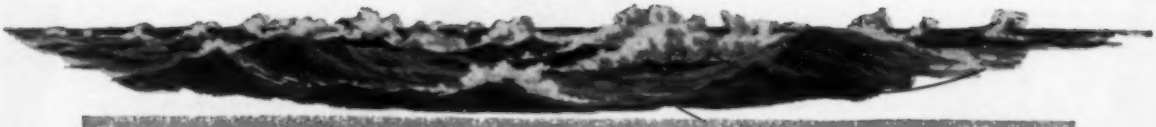
Radio communication was maintained at all times between the helicopters and their base, while a link between the Doha telephone exchange and the Shell communications centre made it possible to speak to anyone in Doha whilst flying to and from the rig. D/F. equipment was also provided to enable the aircraft to home on to the rig in conditions of poor visibility.

As was only to have been expected, a number of difficulties had arisen as a result of the adverse operating conditions, but these had all been overcome during the early progress of the operation and the schedules were now running smoothly. Special techniques employed to counteract the effect of sand abrasion on the rotor blades included washing down the machines thoroughly with distilled water at the end of each day's flying, and covering the paintwork with a protective varnish.

Mr. Bristow concluded his lecture by refuting the viewpoint commonly held that extensive helicopter operations, including those into city centres, must await twin-engined machines.

To seek the hidden enemy...





Soon, the oceans around Canada will be patrolled by the first aircraft developed specifically for Canadian maritime reconnaissance duties . . . the Canadair-designed CL-28.

Developed from the Bristol Britannia class by Canadair, this is the largest aircraft ever to be manufactured in Canada and we at Canadair regard it as a tribute to our capabilities that the RCAF selected us to do the job.

Size, of course, is not the only factor, for we are equally at home in the design and production of jet fighters, training planes, airliners, guided missiles or even components for other aircraft. What counts most is our outstanding record for cost performance, on-time deliveries and quality of manufacture.

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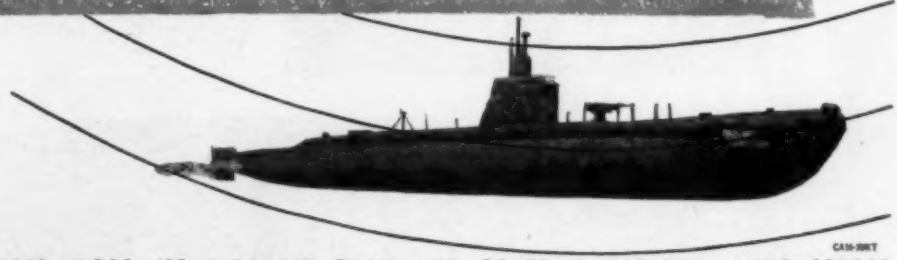
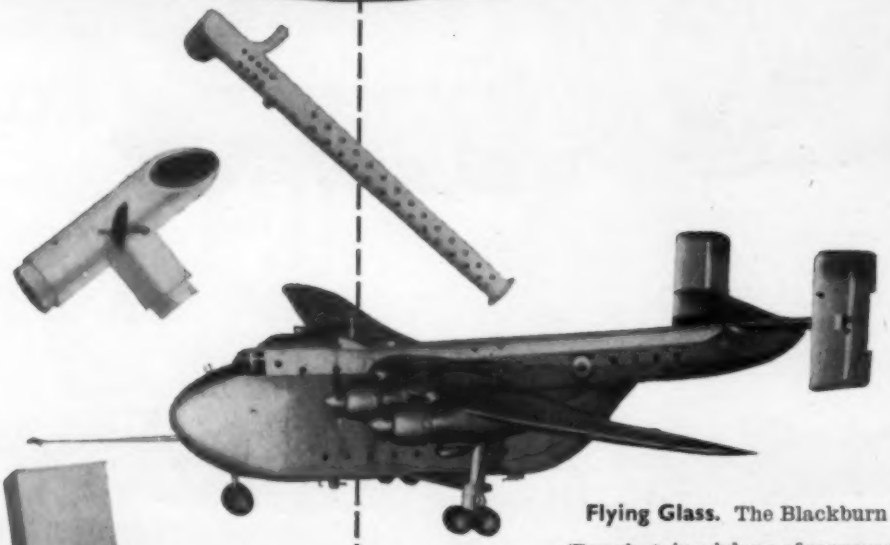
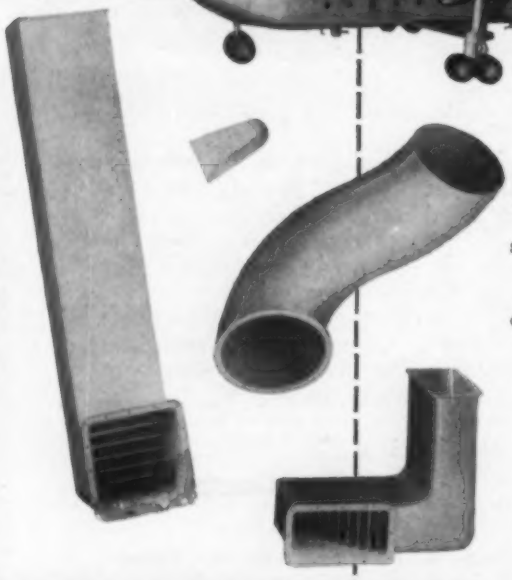


CA56-18KT

CANADAIR HAS PRODUCED MORE JET AIRCRAFT THAN ANY OTHER CANADIAN MANUFACTURER

Moulding the future . . .





Flying Glass. The Blackburn 'Beverley' is a 'plane of many parts. Those shown here are complex in character, vital in the parts they play. They had to be light in weight yet as strong as steel, fireproof and chemically inert; they had to be easily and cheaply fabricated in one piece. In other words they had to be Fibreglass Reinforced Plastics.

The Fibreglass cloth reinforcement was supplied by Fothergill & Harvey (Sales) Ltd.

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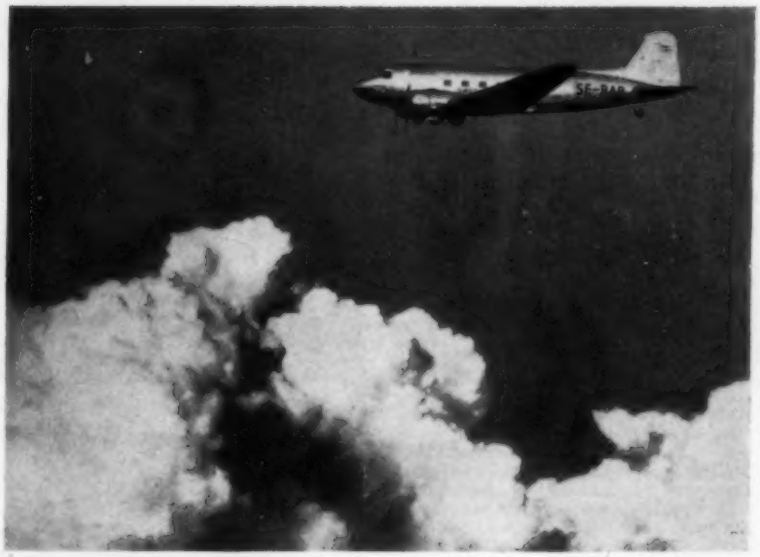
VETERAN DC-3s

Some Remarkable Achievements of Air Hour Totals

By DENNIS M. POWELL, F.R.G.S.



A well-remembered photograph, taken in 1937, of Swedish Airlines' SE-BAB, "Hoken." Now renamed "Bele Viking," and wearing a more modern livery, this DC-3 is still in S.A.S. service.

ALTHOUGH large numbers of "old faithful" Douglas DC-3s are slowly but surely being replaced by newer transports on several major airlines who are I.A.T.A. members, I.A.T.A. statistics reveal that some 700 aircraft of this type were still operated by these carriers at the end of 1955, and at least an equal number are still in active commercial service all over the globe. Their non-I.A.T.A. operators include large numbers of "little airlines" in America and elsewhere, and at least 300 of the aircraft are owned and operated by a wide variety of American companies as general business and executive-cum-V.I.P. transports. Furthermore, most of the world's major and minor air forces still employ several hundred Military C-47 Series on a wide variety of duties.

The main object of this article is to record some of the most truly outstanding examples of really veteran "long-hour" DC-3s still performing, with almost monotonous efficiency, the normal routine tasks of carrying thousands of passengers and many tons of mail and cargo every year.

Turning back the clock some twenty-odd years, the first seven DC-3s built all went to American Airlines Inc., which included the prototype NX14988 (which made its historic first flight on December 24th, 1935) and the first production aircraft NC16001, which later became 42-56097—a C-49E* in the U.S.A.A.F. some time early in 1942. There does not appear to be documentary evidence to show just how these first two DC-3s built ended their careers in World War 2, and, regretfully, the same inevitable question mark applies to the next two production aircraft of the series —*NC*16002 and *NC*16003. Most probably they were written off or crashed whilst in U.S.A.A.F. war service, like so many other thousands of aeroplanes between 1939 and 1945.

However, the fifth, sixth and seventh DC-3s—all of which were originally delivered to American Airlines Inc. in June 1936—are still going strong! They are N16004, now owned by Air Services Inc.; N16005, owned by Ozark Airlines Inc. of St. Louis, Missouri; and N16006, which belongs to East Bronze and Aluminium Foundry Inc. (it is used as an executive transport). Although the precise airframe-hours of each of these 20-year-old transports has not been revealed by their current owners, N16005 is believed to have logged the greatest total—about 53,000-plus hours—whilst the other two are each around the 48,000-hour mark.

A DC-3 originally delivered to T.W.A. in 1937 is now being operated by California Central Inc., a small airline located at Burbank. It is N17318, and up to October 1st, 1955, had amassed the huge total of 55,080 hours, logging 8¼ million miles in 18 years of continuous service. From June 1942 to August 1943 this DC-3 served in the U.S.A.A.F. It was then returned to T.W.A., who eventually sold it in January 1953. It was not purchased by Col. Charles C. Sherman (C.C.A.'s president and director of operations) until January 1954, and I do not know the identity of its interim-period owner.

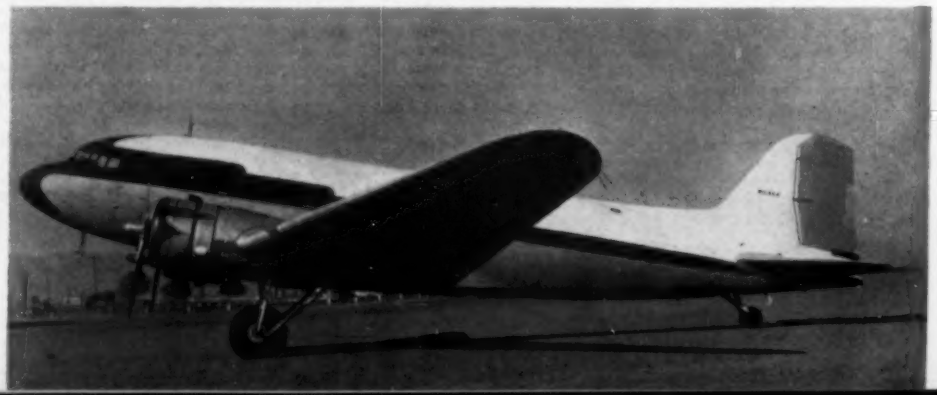
Another "long-hour" Douglas is N18124 (C.N.2000) of Eastern Airlines Inc., which was retired from active service on May 1st, 1953, having logged no fewer than 56,782 hours and flown 8½ million miles in 15 years of service. N18124 has the truly unique distinction of now being permanently exhibited at the Smithsonian Institute in Washington, D.C., alongside such historic aircraft as Lindburgh's *Spirit of St. Louis* and Wiley Post's Vega *Winnie Mae*. (This Eastern DC-3's remarkable career was described by the writer in considerable detail in *Flight* of September 18th, 1953.)

Three United Airlines DC-3s—all of which were delivered to that airline early in 1937—had amassed the huge total of over 143,000 airframe hours between them before they were sold in July 1953. They are N16070, N18939 and N16065, and their respective hours up to June 1953 were 49,460, 47,670 and 46,236. I have not been able to trace the present owners of these aircraft, but it is believed all three subsequently went to South America operators.

Of the large number of DC-3s still flying in Europe it is least easy to record detailed individual histories. Undoubtedly SE-BAB (C.N.1972), still flying on S.A.S. domestic schedules, is one of the oldest veterans. Originally delivered to A.B.A. (Swedish Airlines) in September 1937 and then named *Hoken*, she operated in company with her two sister DC-3s, SE-BAA and SE-BAC on A.B.A.'s main routes from Stockholm to London, Moscow, Paris, Copenhagen and Berlin until the outbreak of World War 2. During the war years she flew mainly on Sweden's domestic routes, although she made many flights to both Berlin and Aberdeen (Dyce Airport), rightfully pursuing her "privileges" as a neutral; the word "Sweden" was boldly painted (in 5ft-high letters) on each side of her fuselage, and underneath it as well.

With the end of the war SE-BAB (in company with -BAA and -BAC) resumed her peaceful career once more. Although -BAA

**C-49, as opposed to C-47, was at that period the designation of civil DC-3s impressed into military service.—Ed.*



N16004, the fifth DC-3 built, is still flying with Air Services Inc., a U.S. charter operator. She was originally owned by A.A., Inc. Precise airframe hours are not known, but are believed to be at least 48,000.

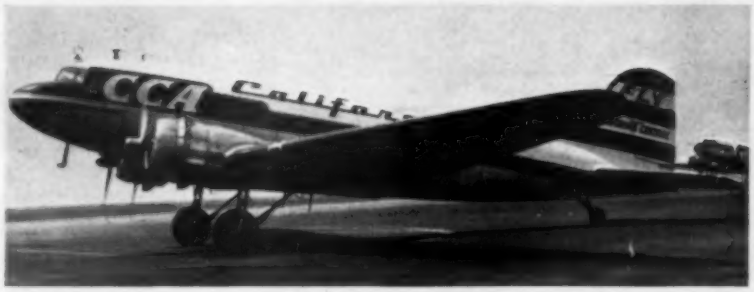
N16005, now owned by Ozark Airlines of Missouri, was the sixth DC-3 built (C.N. 1499) in January 1936. Airframe hours to mid-1955 totalled approximately 53,000.

VETERAN DC-3s . . .

and -BAC no longer fly with S.A.S., -BAB is still with them. In June 1951 she was renamed *Bele Viking*, and up to the end of 1955 had logged about 16,000 hours and flown about 4½ million kilometres in almost 18 years of service.

Another remarkable "long-hour" DC-3 flying in Europe is YU-ABM (C.N.1980) belonging to J.A.T., the Yugoslav Government airline. She was originally owned by K.L.M. in 1938, being registered PH-ARB and named *Buizerd*. Only a few K.L.M. DC-2s and DC-3s managed to escape when Holland was invaded by German forces in 1940, but PH-ARB was one of them. She then became G-AGBD and for the rest of the war flew on the U.K.-Lisbon and U.K.-Stockholm routes of B.O.A.C. In February 1946 she was returned to its rightful owners, K.L.M., who operated her on their European routes. In August 1946 this DC-3 once more became G-AGBD, as she was sold by K.L.M. to Skyways, Ltd., who named her *Sky Hawk*.

Skyways then used G-AGBD on a large number of charter flights within Europe. Later she carried out a series of flights on behalf of the Kuwait Oil Co. between Kuwait and Beirut, carrying both staff and numerous cargoes of food supplies (including frozen vegetables from Beirut). In January 1952 B.O.A.C. took over the oil company's contract, and this aeroplane then flew under the colours of British International Airlines, Ltd. (owned by B.O.A.C.). This little airline also used another DC-3, registered G-AIWC, on similar duties.



N17318 (C.N. 1933), operated by California-Central Airways Inc., of Burbank, was built, and delivered to T.W.A., in 1937. This particular DC-3 has flown more hours (55,080) than any other type of aircraft in the world with the sole exception of Eastern Airlines' DC-3 N18124 (C.N. 2000) which was "retired" in May 1953 after having logged 56,782 hours.

In November 1952 *Sea Hawk* was sold to Transair, Ltd., of Croydon. About a month later they in turn sold her to Field Aircraft Services, Ltd., who gave the veteran a most extensive C. of A. overhaul, including the fitting of 21 new fully reclining seats in the passenger cabin. In fact, Field's have long established a reputation for superior workmanship in bringing C-47s to fully "airline standard" DC-3 conversions, and G-AGBD's conversion was no exception to this rule. In March 1953 the aircraft was once again sold, now becoming YU-ABM of J.A.T. (Yugoslav Government Airlines). She is still flying with them, and I understand the Yugoslav pilots have a high regard for her "excellent all-round performance." Considering that her original airframe is almost 18 years old and has logged at least 20,000 hours, this compliment is probably all the more remarkable.

This article would not be complete without saying a few words about Swissair's HB-IRA, which was sold to an American buyer in March 1955, and ferried by Fleetways Inc. as N2815D on March 31st from Zurich to New York *via* Prestwick, Keflavik and Gander. She was one of the very first DC-3s to be sold to an European airline, being assembled by the Fokker Factory at Amsterdam in April 1937 and receiving her first C. of A. on May 5th of that year.

HB-IRA was a regular visitor to Croydon up to the outbreak of war, after which she operated on Swissair's few war-time "restricted" routes between Zurich/Geneva to Lisbon, Ankara, Berlin and Stockholm. Shortly after V.E. Day HB-IRA once again became a regular visitor to Croydon and later to Northolt. From 1952 onwards she operated into Heathrow (with the gradual closure of Northolt, B.E.A. and other foreign airlines eventually operated into London Airport as, of course, we know Heathrow today). Like a very large number of the earliest DC-3s, HB-IRA was originally fitted with Wright Cyclone (Series GR-1820-G2) engines developing 850-1,000 h.p.; later the more powerful Wright (Series GR-1820-G102A) powerplants were installed, developing 1000-1,200 h.p. So far as I have been able to ascertain, this Swissair DC-3 has always remained a standard 21 seater during its 17 years of service in Europe.

It seems that HB-IRA (together with HB-IRE and HB-IRD, which were sold to the U.S.A. at the same time) have now begun new careers in America. Most probably the ex-Swissair trio have been given "full conversion" treatment by their new owners. For the record, I understand HB-IRA logged approx. 15,000 hours and flew an estimated 2½ million miles between June 1937 and March 1955—not such impressive figures as those for some of the American-owned DC-3s described above, but nevertheless a most commendable performance.

ELECTRONIC FLIGHT-PLANNING

SUCCESSFUL tests have been concluded by the Joint Numerical Weather Prediction Service at Suitland, Maryland, using an electronic computer to calculate the best flight-paths for aircraft. Routes from a given starting place to several destinations could be printed by the computer, each path being the one that would result in the shortest flying time. Courses were specified by the latitude, longitude and heading of the aircraft at half-hour intervals.

The computer used in these tests was an International Business Machines' Model 701. The machine now makes daily forecasts of wind speeds at several heights in the atmosphere, these forecasts being recorded on magnetic tape, and the mathematics required for this computer to print out minimal flight paths have been worked out.

The tests have been conducted under the auspices of the U.S. Air Weather Service, which is now making plans to adapt upper air forecasts to include minimal flight-paths. First news of this new service was given recently at a joint meeting of the American Meteorological Society and the I.A.S. in New York.

BELFAST WORKS EXPANSION

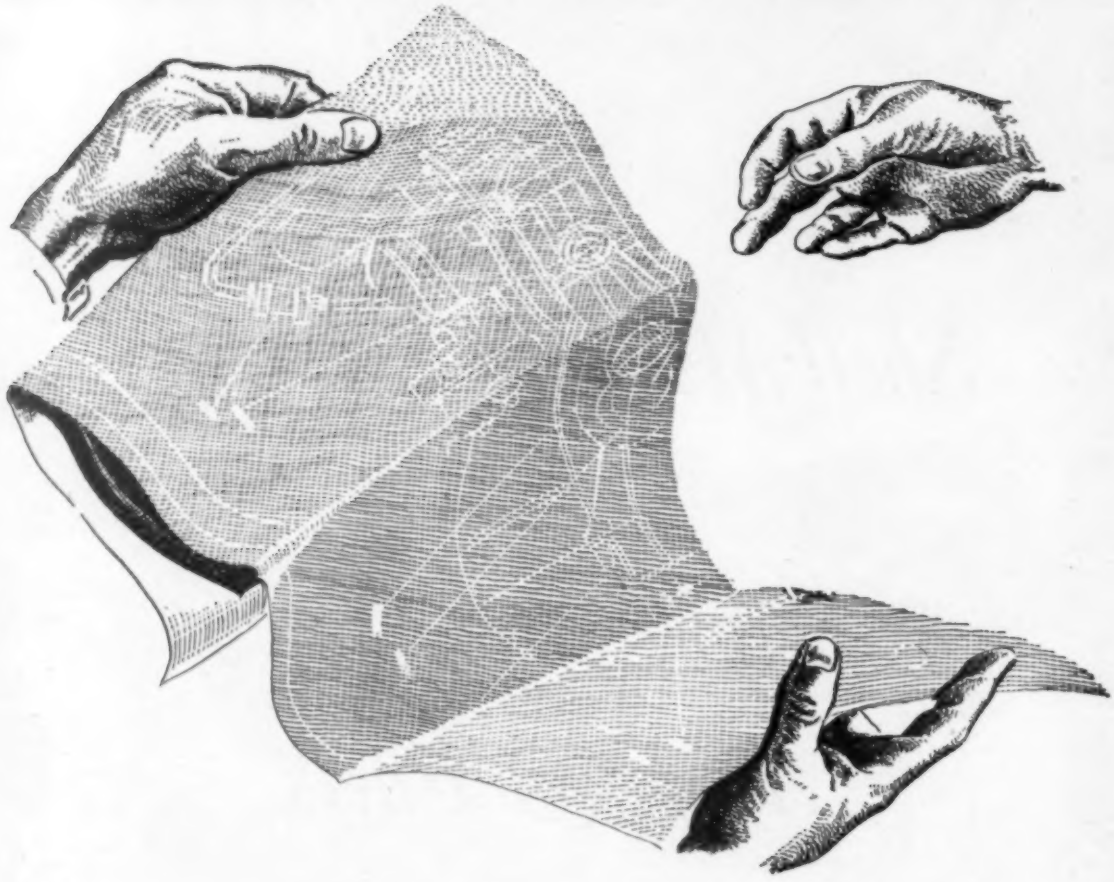
THE Northern Ireland Minister of Commerce announced last week that negotiations have been completed with Short Brothers and Harland, Ltd., for further expansion of the company's activities on the Ministry's factory estate at Castlereagh, Belfast.

The company's precision engineering division is at present occupying two factories on the estate and it was announced in October last year that a new research block would be provided there. The Ministry has now agreed to build an additional new factory of 44,000 sq ft for high-precision engineering work, and it is expected that the company's total employment at Castlereagh, following completion of the new buildings, will rise ultimately to at least 1,350 workers.

In addition to their activities at Castlereagh and in their other established factories in Northern Ireland, Short Bros. and Harland have now completed their negotiations for the acquisition of premises at Ballyclare, where ultimate employment is expected to reach 300 workers on the production of aircraft parts.

Shell-Mex and B.P. Ltd are the principal suppliers of Aviation Fuels to the Royal Air Force in the United Kingdom

Shell-Mex and B.P. Ltd., Shell-Mex House, Strand, W.C.2. Distributors in the United Kingdom for the Shell BP & Eagle Groups



Presenting to-morrow's triumphs....

They begin as plans; the plans take shape as three-dimensional prototypes; then those suspected problems become headaches—and this is where we usually come in. We are familiar with such situations because we have had the privilege of assisting in the solution of many thousands of knotty problems during the 50 years or so of our existence, and we are quite naturally proud of the confidence shown in us by manufacturers and designers.

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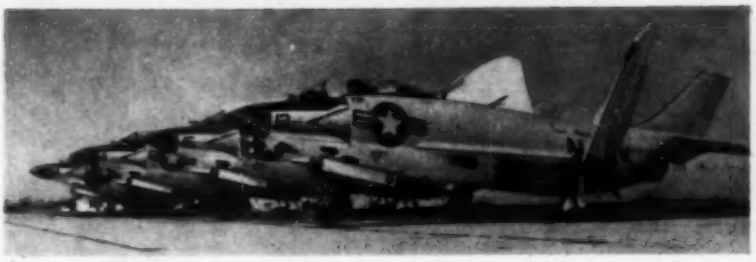
Design, Research and Manufacture of Aircraft Components

★ *Our current contracts include the design and production of Pressurisation Ducting; Cabin Sleeping Berths and Luggage Racks for the Bristol Aeroplane Company's Britannia aircraft; production of Nacelle Frames and other Air Frame Components for Messrs. Vickers Armstrong's Viscount aircraft and for the same Company N.113 Fighter Air Frame Components, and special conversion work on Messrs. A. V. Roe's Shackleton aircraft.*

SALES OFFICE: Birmingham Airport, Elmdon, Birmingham 26. Sheldon 2630/2639
LONDON OFFICE: 5, Clarges Street, London, W.1. GROsvenor 4653. *WORKS: Elmdon and Aberdare.*



Symbolizing America's mounting experience with high-powered turboprops is the impressive picture on the left showing the two U.S.A.F. Boeing YC-97J Stratofreighters with Pratt and Whitney T34s. The second picture shows McDonnell F3H-2N Demon fighters of the U.S. Navy (see paragraph on this page).

AIRCRAFT INTELLIGENCE

U.S.A.

Convair R3Y-2 Tradewind. Convair having completed their contract for eleven of these magnificent machines—powered with four Allison T40 turboprops and capable of nearly 400 m.p.h.—deliveries should begin this spring.

Martin P6M SeaMaster. Production versions of this four-jet mine-laying and reconnaissance flying-boat will be powered with Pratt and Whitney J75 turbojets instead of the Allison J71s installed in the prototypes.

McDonnell F3H-2N Demon. Six of these swept-wing naval fighters were flown from the McDonnell plant in St. Louis to the Patuxent Naval Air Base in mid-January to begin their "fleet introduction programme"—a programme which has now been completed and has been described as one of the most successful ever held. The accelerated flight and maintenance schedule involved over 600 hours' flying and the pilots gained the name "Demon drivers." The programme included catapult launches, simulated carrier landings, night instrument flying, night interceptions and night formation flying. The F3H-2N version of the Demon has an Allison J71 turbojet and is armed with four 20 mm guns. Meanwhile, the makers have announced that an order for additional Demons, totalling over $55 million, has been received. Some of these will be F3H-2Ns and the remainder of a new missile-carrying model.

France

Fouga News. The first production Fouga Magister twin-jet trainer flew on February 29th. As production goes ahead the company will be developing a new swept-wing trainer powered with two Turboméca Gabizo turbojets as well as a naval version of the Magister.

Jodel Two-Seaters. The Société Wassmer, which has already built and delivered thirty Jodel two-seaters, is about to embark on another batch of fifty D.112 (65 h.p. Continental) and D.120 (90 h.p. Continental) machines. Production rate will be four to five machines a month.

S.E.212 Durandal. This delta-wing interceptor, powered by a S.N.E.C.M.A. Atar turbojet with reheat, is almost complete, and the first taxying trials should be made at the end of this month.

S.E.210 Caravelle. Having completed its constructors' test programme, which included 117 flights totalling 266 flying hours, the Caravelle twin-Avon airliner is now at Istres, where it will be flown by official Flight Test Centre crews, headed by M. Lanvario. Fifty flying hours will be put in at Istres, followed by 500 hours of endurance testing with an Air France crew. The second Caravelle should fly in April or May this year.

Bréguet Gliders. The Bréguet S.10 is described as a stratospheric research glider of revolutionary type, having a pressurized cabin and capable of an extremely high ceiling. Flight tests are scheduled for spring next year. The Bréguet 901-03 (third prototype) and a second production model of the 901 have just been delivered, and production will soon be at the rate of two a month. The 904 two-seater will begin its tests in a few weeks.

Saudi Arabia

D.H. Chipmunks. The 1,000th Chipmunk, built at de Havilland's Chester factory, has been delivered to Saudi Arabia. It is one of a batch of unspecified size. The machines are being crated and delivered by sea.

Japan

V.T.O. Aircraft. The Japanese Government is to provide a subsidy of 750,000 yen for the production of a Japanese-designed-and-built V.T.O. aircraft. The "first flying test" is to take place this month at the Kawasaki factory in Gifu.

C.A.S.A. 207 AZOR
(Two Bristol Hercules 730)
Span ... 91ft 1in
Length .. 68ft 5in

Until the new extensions to Viscount floor-space at Weybridge are completed, Hurn will continue as the main source of Viscount supply. Of the two 900ft erecting halls there, one—shown above—is devoted exclusively to the production of Capital Airlines aircraft. Below, the new extension (900ft in length), as yet unoccupied, to the Weybridge production line. Foundations for a second similar hall alongside are already being laid out. It was from the line above that the 100th Viscount recently came (page 340).

300 Viscounts Ordered, 100 Delivered

Plans to Double Output Now Well Under Way

"FLIGHT" photographs

THE announcement in Teheran on March 12th that the Persian Government has placed an order for three Vickers-Armstrongs Viscounts brings the total number of these aircraft now sold to 301. By a coincidence the 100th Viscount off the production line, N7416—a 745D for Capital Airlines—was a few days later handed over to the customer at the main production centre at Hurn.

This historic double comes at a time when the Vickers programme to increase Viscount production floor space from 413,450 sq ft to 808,250 sq ft is already half accomplished. Plans for this formidable expansion were announced last autumn, and the extra capacity is being provided by quadrupling the length of the two parallel 300ft erecting halls at Weybridge. One of these extensions, 900ft by 125ft, is now finished, and will begin Viscount assembly almost immediately. Its neighbour will be ready for use at the end of this year. Weybridge will then have greater capacity than Hurn, which since it began deliveries in 1953 has been the main source of Viscount supply: to date 62 aircraft have been completed there. Weybridge, since it delivered the first production Viscount (G-ALWE for B.E.A.) on January 3rd, 1953, has built 38 aircraft. The accompanying table shows how floor space and production at each factory have grown: by the end of this year total capacity will be three times the 1953 figure. Thus, while the pattern of production at Weybridge—the centre of design and engineering—is today one of small batches and "one-offs," the works there will soon be as capable of quantity production as Hurn. It seems likely that Weybridge

will specialize on the Viscount 800, and subsequently the Vanguard, with Hurn continuing 700 manufacture. The first 800 fuselage is already made (*Flight*, March 16th), and the first of B.E.A.'s 802s will fly in June, with eight due for delivery by the year's end.

There seems no doubt that the future combined Weybridge-Hurn output will more than match the pace at which the order-book is filled. Yet the old dilemma—so familiar to the British industry—of no production without orders, no orders without production, is still present even with a best-seller like the Viscount (one has been sold every other day so far this year); and the doubling of production capacity, even with a two-year backlog of 200, is not a measure that could have been embarked upon lightly. Some idea of the effort being put into the Viscount programme may be gained from the fact that this expansion anticipates continued production for several years ahead at an annual rate substantially higher than the 89 planned for 1956 (42 were built in 1955, 22 in 1954 and 22 in 1953).

Last week we renewed our acquaintance with the Viscount factories at Weybridge and Hurn, and were forcibly impressed by the tempo of activity and the scale upon which —given the orders—civil aircraft production can be organized. The scene at Hurn is especially heartening: on the day of our visit two Viscounts, fresh-painted in the eye-catching scarlet-and-white styling of Capital Airlines, were being prepared for flight, one (the air-

FLOOR AREA (SQ FT) DEVOTED TO VISCOUNT PRODUCTION
(Figures in brackets denote number of aircraft delivered, or to be delivered in 1956 and 1957.)

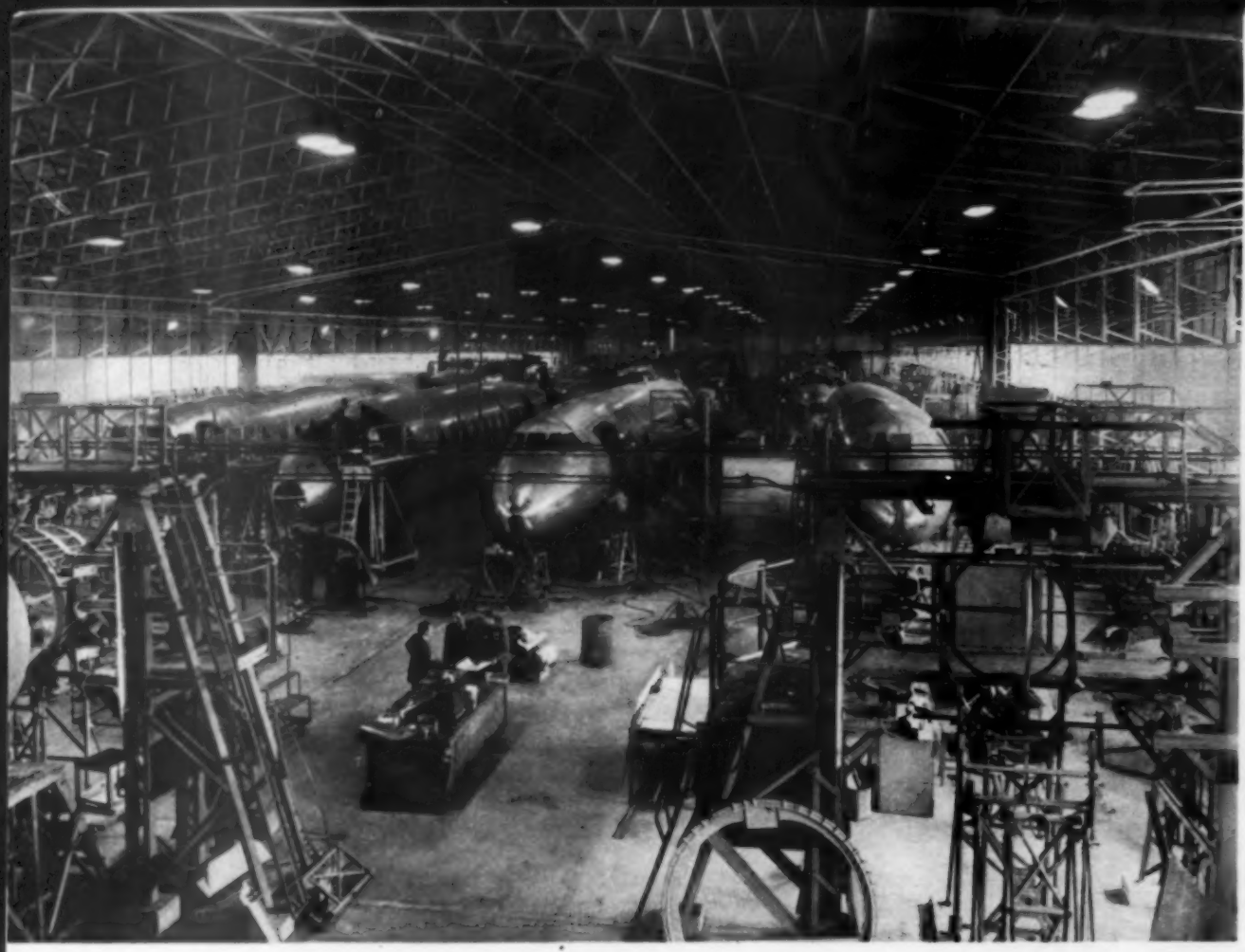
	1951	1952	1953	1954	1955	1956	1957
Hurn	—	—	175,300	175,300 (13)	324,075 (34)	355,125 (77)	355,125 (68)
Weybridge ...	114,625	114,625	102,625 (22)	59,250 (9)	89,375 (8)	300,625 (12)	453,125 (50)
Totals	114,625	114,625	277,925 (22)	234,550 (22)	413,450 (42)	655,750 (89)	808,250 (118)

Above, Hurn is the main centre of fuselage manufacture, and the picture shows some of the 18 jigs for the construction of front and rear fuselage sections. Below, the starting point of the Capital line from which aircraft roll away at the rate of one a week. Note the full stock of Rotol airscrews and Rolls-Royce Darts alongside the assembly line.

line's fourteenth) for delivery to Washington, the other for acceptance by the resident Capital engineers. The assembly line from which they had come occupies entirely one of the two big erecting halls on the south side of the airport. The scene inside was one of orderly hustle and (something which black and white photographs cannot capture) colour—scarlet paint schemes, vivid blue protective polyvinal plastic, beige primer, green assembly jigs.

One formed an immediate impression of method and system, and reflected on the fact that never before in this country have production engineers been able to get down to a batch of 60 civil aircraft, all to one specification. Nevertheless, it is a measure of the flexibility of the Viscount production machine that it can handle so many varied customer-requirements at one time. We were reminded of the fact that as many design man-hours went into the North American Viscount as went into the original aircraft, and realized that the days when one standard aircraft was good enough for everyone are long since past. The Capital erecting hall at the time of our visit contained aircraft Nos. 16 to 25—the latter as yet a wingless shell fresh from the nearby fuselage assembly shop, and the former being peeled of its anti-scratch coverings before flight test. The Capital order is due to be completed by the end of the year.

The adjoining erecting hall was fully occupied with general Viscount production. Here the single line, at the moment made up of aircraft for Commonwealth airlines, is parted in the centre; flowing towards one end were the first two 748s for Central African Airways, and the seventeenth 724 for Trans-Canada Air Lines. Towards the other end flowed the first three 720s of the Trans-Australia Airlines



repeat order, and the eighteenth 724 for T.C.A. The African aircraft, the first of which had completed engine runs, was noted to differ from previous Viscounts in not having Rotol airscrews: four-blade D.H. units of similar square-tipped, wide-chord planform were fitted to the Dart 510s.

Hurn is the main source of fuselages, and two large hangars are solely occupied with this work, one on sub-assembly, the other on final assembly. The former contains eighteen massive cantilever jigs, a dozen of which are building type-700 front and rear sections, and a half a dozen already well advanced on the longer (type-800) Viscount Major fuselages—three on front sections and three on rear halves. Black and yellow progress boards record the customer's name, the date each jig was loaded, and, unequivocally, the target date. In the nearby main fuselage assembly hall, the half-sections made in the sub-assembly shop are conjoined, and the jig-pattern here is thus six 700s and three 800s—three rows of three, with overhead boards to denote each line. Four fuselages (including the first 800) were off their jigs being finally finished off before proof-pressure-testing. Again, each jig has its individual progress placard, prominently displaying the target date, plus a snag-sheet entitled —unnecessarily gloomily, perhaps—"Agony Board."

300 VISCOUNTS ORDERED

100 DELIVERED . . .

Weybridge operates to a similar formula, although on a smaller scale until the new extensions to the two erecting halls are in action. There were five aircraft being processed, a 724 for T.C.A. (their sixteenth), plus the three for Compania Cubana de Aviacion (ex-Airwork contract). A nearby hangar provides a second source of fuselages.

In the main factory at Weybridge we glimpsed again some of the tributary streams that flow into the two main production lines. They are considerably swollen in comparison with their size only a year ago, as indeed is the stream of Rolls-Royce Darts from Derby, and the multiplicity of accessories, equipment and sub-contracted parts from up and down the country. We saw also something of the company's commercial department, where from the volume of world market research work and route-analysis studies it was apparent that Vickers do not, as they might be justified in doing, regard the Viscount as an aircraft which sells on its great technical merit alone.

Top, at Hurn a dozen fuselages at a time are handled in the department shown here. The aircraft in the centre is the first Viscount Major for B.E.A., due to fly in June. Right, with a Capital Airlines crew on board the fourteenth 745D starts up at Hurn on March 13th for the delivery flight to Washington, where it will be put into service immediately on arrival.

Vacancies!

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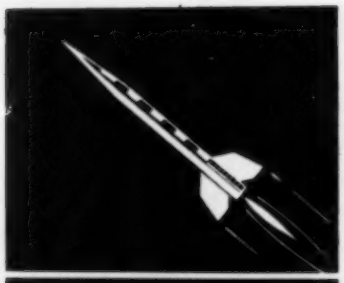

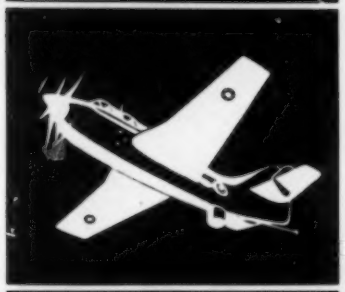

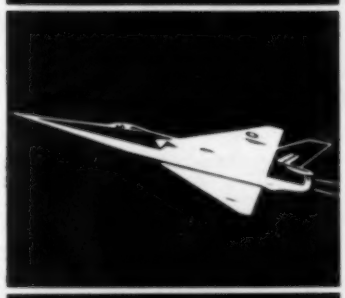

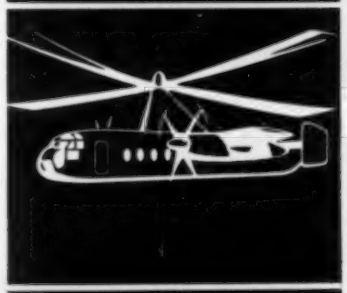

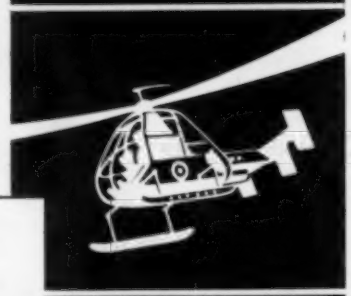

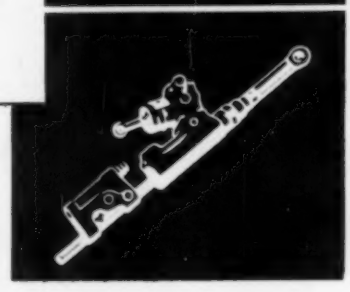

IN THE COLUMNS of this journal over the past few months, you have seen the many and varied aspects of our work; fixed and rotating wing aircraft, guided weapons and hydraulics. To deal with this expanding and important programme, we urgently need more design staff.

Vacancies for all grades exist in every branch. Previous experience of aircraft or aero engine work is an advantage but there are many opportunities for those with other backgrounds, particularly mechanical engineering experience.

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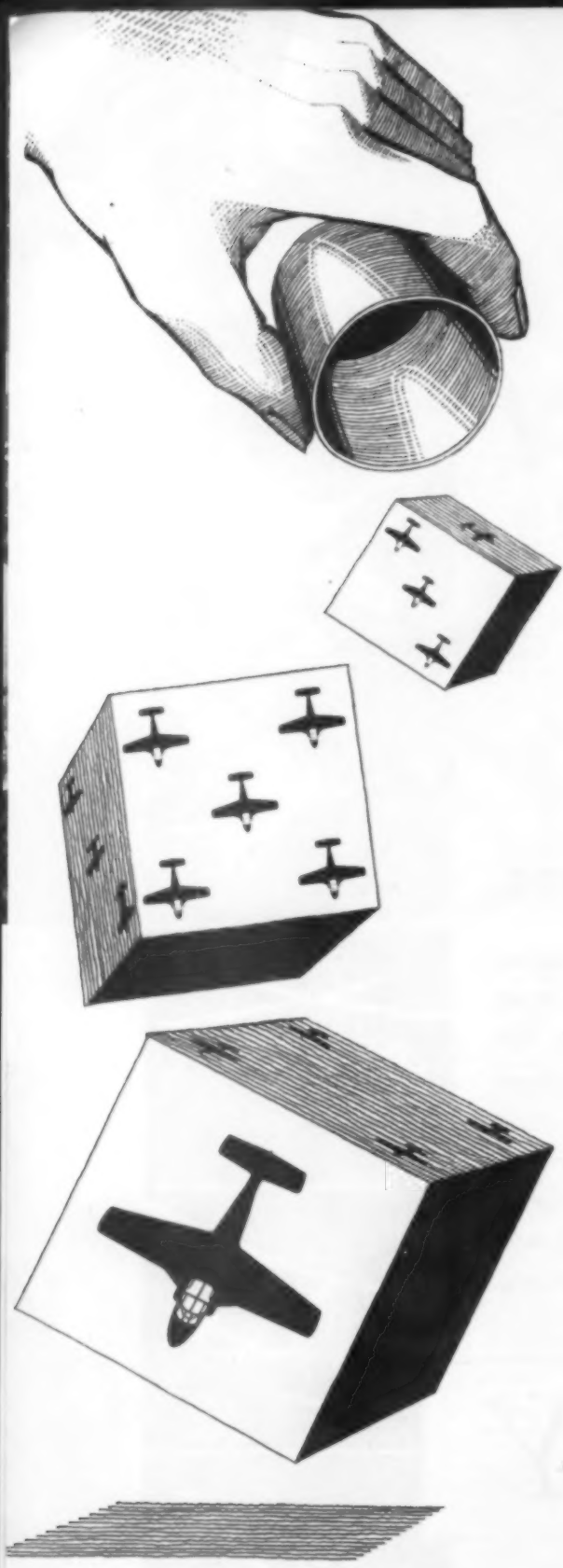
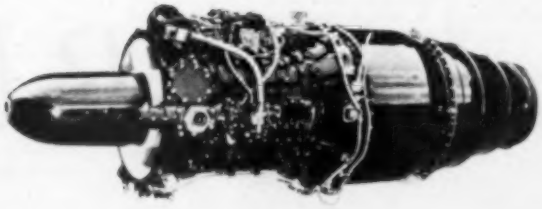


Luck is no ally...

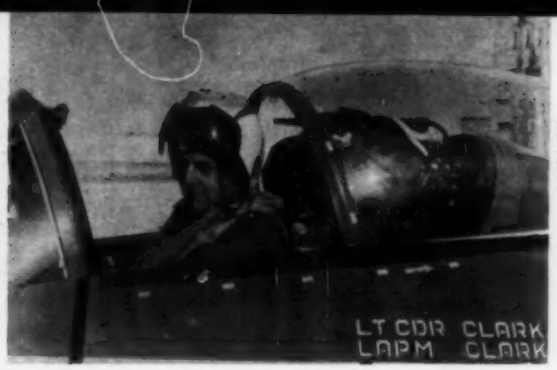
We do not like good luck. In fact, we take considerable care that it plays no part in the evolution of our aircraft engines. Only by testing, re-testing and testing again, only by total elimination of the chance factor has the success been assured of such engines as the Viper turbojet, power plant of Britain's first basic jet trainer.
And only by applying the same relentlessly methodical approach to the further development of these proven types can their great potentialities be fully realised to advance Britain's progress in the air.



ARMSTRONG SIDDELEY AERO ENGINES

ARMSTRONG SIDDELEY, COVENTRY & BROCKWORTH

Members of the Hawker Siddeley Group



Commanding officers of the two Sea Hawk squadrons shortly to embark in H.M.S. "Eagle," Lt-Cdr. A. R. Rawbone, A.F.C., of 897 (left) and Lt-Cdr. A. B. B. Clark of 899.

SKILL at ARMS

—*from a Sea Hawk Cockpit: 897 and 899 Squadrons Visited at Brawdy*

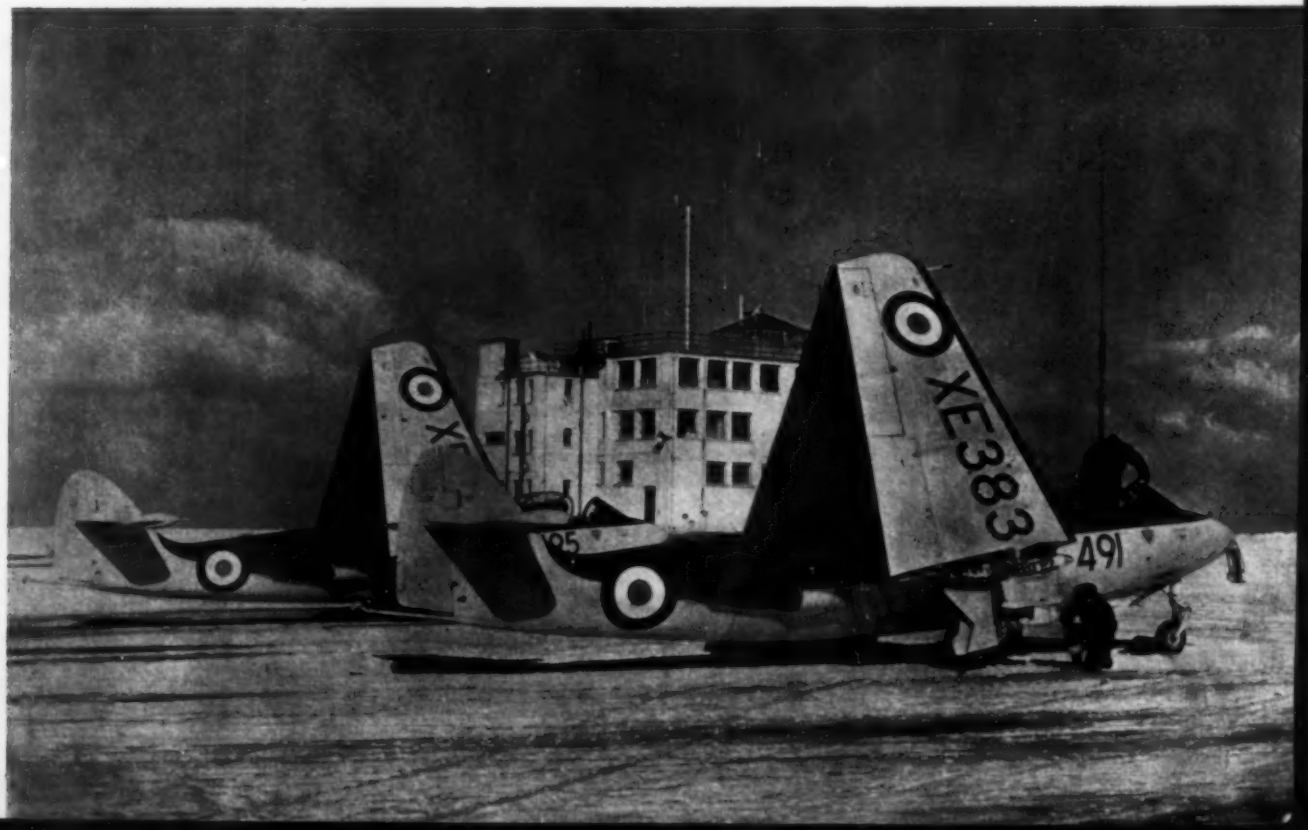
THE life of a front-line Naval squadron, in accordance with the current "Air Group cycle" of operations, is short. The cycle calls for a five-month shore-based working-up period following the formation of the squadron, followed by eight months' operational service aboard a carrier. One of the most important phases of the work-up is a three-week period of intensive armament practice, and it was at this stage of the game that *Flight* recently survived the rigours of a Brawdy freeze-up to record the activities of Nos. 897 and 899 Squadrons.

The ubiquitous Dominie—a refrigerated model from Brawdy's station flight—had been our transport to the snow-covered Pembrokeshire base (alias H.M.S. *Goldcrest*). On arrival, one of the first things to meet our eyes was the baleful stare of a Caspian tern, prominently emblazoned on the nose of a brace of 897's Sea Hawk F.B.3s. The device, we learned later from the Commanding Officer, Lt-Cdr. A. R. Rawbone, A.F.C., had been "freely adapted" from the diving tern of the squadron's crest.

The two squadrons at Brawdy were commissioned on November 7th, 1955, and are equipped with Sea Hawk F.B.3s and Sea Hawk FGA.4s respectively. The Mk. 3 fighter-bombers carry four fuselage-mounted 20 mm Hispano Suiza cannon and have provision for two 500 lb bombs beneath the wings, while the Mk. 4s have in addition provision for ten underwing rocket projectiles. Thus the emphasis has been on air-to-air interception and gunnery

"Flight" photographs

Two Sea Hawk FGA.4s of 899 Squadron on the line at Brawdy. XE383 is being prepared for a dive-bombing sortie.



SKILL AT ARMS . . .

for 897 and on ground attack with R.P.s for 899 (which is commanded by Lt-Cdr. A. B. B. Clark)—although both squadrons are fully capable, in addition, of dive-bombing and strafing work.

Complementary to each other, and to the other components of the air group which is to embark in H.M.S. *Eagle* next month, the two squadrons are training in parallel all through the work-up period. Both carried out deck-landing practice aboard H.M.S. *Bulwark* during February, following MADDLs (the familiar ADDLs, or airfield dummy deck landings, but with the mirror aid) at Brawdy. The other units of *Eagle's* air group will include Wyverns, Gannets and Skyraiders; it may be recalled that the work-up of 830 and 831 Squadrons' Wyverns at Ford was described in *Flight* of March 9th.

Flying activity for the Sea Hawks at Brawdy is aimed at a target rate of 20 hr per month per pilot; and except for the deck-landing period, when hours were necessarily restricted, this is in general being achieved. Serviceability approaches 80 per cent for the new Mk. 4s of 899 Squadron, but is rather less on the older Mk. 3s of 897. Just as important a part of the working-up as the actual flying is the improvement of efficiency of the ground teams: turn-round times, refuelling plus re-arming, averaged some 30-35 min at the time of our visit, the objective being 20 min.

Each squadron comprises three flights, or divisions, each of four aircraft. The flight leaders (in addition to the C.O.) are the Senior Pilot and the Air Weapons Instructor—respectively Lt-Cdr. K. A. Leppard and Lt. L. E. Middleton (897) and Lt-Cdr. A. G. H. Perkins and Lt. P. G. Newman (899). The majority of the remaining pilots have come direct from the R.N. Fighter School at Lossiemouth (without previous squadron experience), and some 60 per cent of them received their flying training with the U.S. Navy. Their individual flying experience on joining the squadrons amounts to some 350 hr, the larger part on jet-powered aircraft.

Commander (Air) at Brawdy is Cdr. E. M. ("Winkle") Brown, O.B.E., D.S.C., A.F.C., M.A., previously C.O. of No. 804 Sea Hawk Squadron, and it was from the commander that we heard details of the range facilities used during the squadrons' three-week "armament practice camp." Brawdy is especially fortunate in these facilities, he told us, the farthest range being only 21 miles away (and the nearest only two miles) from the airfield circuit.

The main air-to-air practice firing range lies out to sea, south-west of the lower tip of Wales, and is provided with both air and surface radar surveillance (the latter from the R.N. Air Direction Centre, Kete). It is in this area, near the rocks of The Smalls, that 897's drogue-towing Sea Hawk patrols its beat. In St. Bride's Bay are the target buoys of the rocket r..ge, also used for dive-

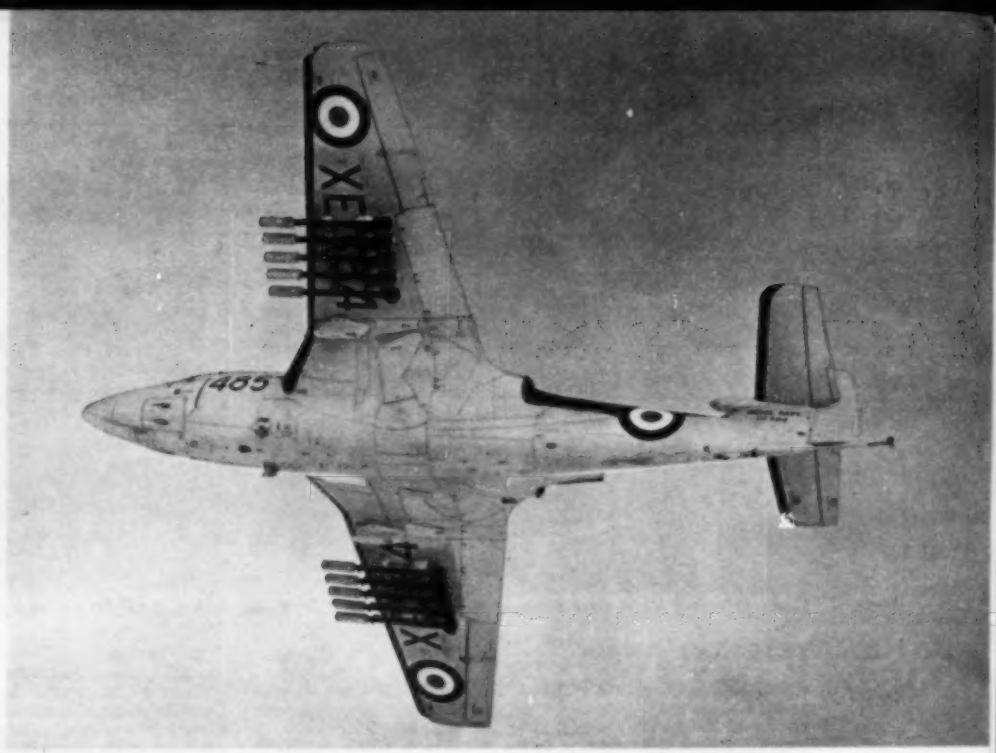
Top, one of the firing targets on the Castlemartin range, seen from the Vampire Trainer during a live attack. Left, 897 Squadron flight-leaders; Lt. L. E. Middleton (A.W.I.), Lt-Cdr. Rawbone (C.O.) and Lt-Cdr. K. A. Leppard (Senior Pilot)—plus one Caspian Tern. Below, armourers at work on a Sea Hawk F.B.3 of 897 Squadron.

Right, a close-up of Lt-Cdr. Clark's Hawk, 60 lb practice rockets—fitted with concrete heads—at the ready, and (below, right) the result of his dive on the St. Bride's Bay target buoys.

Below, a similar view of one of the Sea Hawks which, a careful perusal of the photograph will reveal, is carrying four 25 lb practice bombs.

Bottom photograph: Flight leaders of 899—Lt. P. G. Newman (A.W.I.), Lt-Cdr. Clark (C.O.) and Lt-Cdr. A. G. H. Perkins (Senior Pilot).

"FLIGHT" photographs



bombing and strafing practice; and on the disused airfield of Talbenny are dive-bombing targets, used for camera-checked runs but not attacked "live." For air-to-ground gunnery, rocket firing and dive-bombing, three new ranges have recently been established by the Navy in the Army's artillery range area at Castlemartin, and are being put to good use by the Brawdy Hawks.

Fixed standards of proficiency in firing and bombing are laid down and must be attained by pilots during the practice camp. In addition to the Sea Hawks, each squadron has available one Sea Vampire T.22 trainer, for extra armament or instrument-flying practice if required. Within the framework of the overall syllabus for the work-up period, the detailed flying programme is the responsibility of the individual commanding officers. The weapons programme is planned by the squadron Air Weapons Instructors, who also act as advisers to their C.O.s on armament problems.

Cdr. Brown confirmed during our interview that he had served during the early years of the war as a sub-lieutenant pilot with 802 Squadron, commanded by a Lt. D. C. E. F. Gibson and equipped with Wildcat fighters, aboard the Navy's first escort carrier, H.M.S. *Audacity*. The point of our interest in this was that Lt. Gibson—now Capt. Gibson, D.S.C.—is the present captain of H.M.S. *Goldcrest* at Brawdy.

Flight's previous visit to Brawdy had been almost exactly two years before, on the occasion of 898 Squadron's work-up phase,

"Flight" photographs

(Left) Refuelling on a calm February evening. (Right) Cdr. E. M. Brown, O.B.E., D.S.C., A.F.C., M.A., Commander (Air) at Brawdy.

SKILL AT ARMS . . .

when the Associate Editor wrote "To report that these shrewd young officers are satisfied with their aircraft would be doing the Sea Hawk far less than justice. They are positively delighted. . . ." Very much the same opinion of the Hawk as a pilot's aircraft is reported by the officers of 897 and 899 of the Mk. 3s and 4s now at Brawdy, with added praise for the powered ailerons and improved cockpit pressurization and heating.

We sat-in on a morning briefing of 899 Squadron pilots. The first pair to take-off were getting the word on dive-bombing the St. Bride's Bay target (with the diminutive 25 lb practice bombs) from the Senior Pilot and A.W.I. Meanwhile, the other pilots went though the long and complicated procedure of donning their warm clothing, immersion suits and accessories. Later that day Lt-Cdr. Clark's Sea Hawk was accompanied on rocket-firing and dive-bombing sorties by Cdr. Brown and *Flight's* photographer in one of the Vampire Trainers. At this early stage of the armament-training phase of the work-up, the emphasis was on individual firing and bombing practice, and a normal routine was for the Hawks to take off in pairs. As the day progressed, more gaps in the flight-line were noticeable, the rate of flying being stepped up.

Of Brawdy itself there is little more to say since our report two years ago, except that the permanent building programme is now well under way. New hangars are under construction, and we glimpsed a tantalizing impression of the almost-complete new wardroom, of pleasing contemporary design, as we returned from the line to the icicle-fringed utility hut which contained our cabin. Of no point to this story, but of singular prominence in the writer's recollection, is the acrobatic dummy deck-landing made with the help of iced-up shoes on first entering this, our temporary home. After this theatric entrance, we barely made our cabin in time to hear the pipe announcing that the water had been cut off.

But however cold the weather, there was no doubting the warmth of Brawdy's welcome, nor the high-temperature enthusiasm of the squadrons. Interviews with Capt. D. C. E. F. Gibson, D.S.C., captain of *Goldcrest*; Lt-Cdr. W. Orr-Cubbon, Lieutenant Commander (Flying); and the Air Engineer Officers of both squadrons, Lt. A. D. James (897) and Lt. A. Ashmead (899), confirmed impressions gained from informal talks with the squadron commanders and pilots; impressions of an effective fighting group working-up steadily to a high operational standard on an expanding if isolated base. Yes, agreed a squadron pilot carefully painting a small, precise eight-ball on his bone-dome, the flying rate *was* fairly intensive—there was, of course, nothing else to do.

K.T.O.

OFFICERS OF Nos. 897 AND 899 SQUADRONS

897 Squadron

Lt.-Cdr. A. R. Rawbone, A.F.C.	Lt. E. R. Sutcliffe
Lt.-Cdr. K. A. Leppard	Lt. P. J. Williams
Lt. L. E. Middleton	Sub-Lt. I. W. Graham
Lt. R. G. M. Campbell	Sub-Lt. J. G. N. White
Lt. H. R. Samler	Sub-Lt. G. E. Maynard
Lt. J. D. H. Weyman	Sub-Lt. D. A. Prothero
Lt. D. F. Mills	Sub-Lt. A. D. Hare

Lt. A. D. James (Air Engineer Officer)
Commissioned Elec. Off. C. F. Drake

899 Squadron

Lt.-Cdr. A. B. B. Clark	Sub-Lt. G. D. Varley
Lt.-Cdr. A. G. H. Perkins	Sub-Lt. J. H. Wild
Lt. P. G. Newman	Sub-Lt. D. L. Graham
Lt. J. C. Mather	Sub-Lt. N. R. J. Wingate
Lt. K. R. Steele	Sub-Lt. A. Howarth
Lt. J. W. Beard	Sub-Lt. T. M. Tuke
Lt. P. P. Cardew	Sub-Lt. R. Wren

Lt. F. A. H. Ashmead (Air Engineer Officer)
Commissioned Elec. Off. J. Ingram

THE GLIDING YEAR

THE acquisition of three new club sites was the most important advance in British gliding during the past year, according to Mr. Philip Wills, who presented the chairman's report at the annual general meeting of the British Gliding Association on Saturday last, March 17th. These new sites were at Nympsfield (Bristol G.C.), Bo-Peep Farm (Southdown G.C.) and Hutton Moor (Newcastle G.C.). "Since the last site acquired for any U.K. club was nearly 20 years ago," Mr. Wills continued, "this indeed is an occasion, and one for which most of our gratitude must go to our president, Viscount Kemsley, whose Trust made these acquisitions possible."

In other clubs, however, the position was still desperate. "Our largest centre is still on a one-month lease at Lasham, which makes its further consolidation well-nigh impossible. If it were forced to close down we should lose most of the growth and gains of the last fifteen years." The past year had shown a steady growth in all aspects of the British gliding movement, but the problem of sites remained the main limiting factor.

Statistics from 24 clubs showed that, during 1955, a total of 14,770 hours had been flown from 99,624 launches—increases of 3,319 and 29,648 respectively over the previous year. In addition, 7,194 hr and 95,476 launches had been logged by the Air Training Corps. B.G.A. membership now consisted of 17 full member clubs, 12 associate member clubs, 32 private/group owners, and 28 individual associate members. The number of certificates issued was the highest ever recorded, and included 348 "Cs," 71 "Silver Cs," and four "Gold Cs", one "Diamond" badge and five "Diamond" legs.

The K.1 high-performance two-seater project, Mr. Wills reported, had been carried to the point where a polar curve was produced and this, together with a full report, had been considered at a meeting with representatives of the Ministry of Supply and the Kemsley Flying Trust. Unfortunately no adequate further funds were available to cure the spin trouble which had been encountered, and the prototype had, therefore, been sold to Elliotts of Newbury, who hoped to develop it further.

The report of the world championships master committee disclosed that the aircraft to be flown by the British team in the 1956 contest at St. Yan (June 29th to July 13th) would be "the Slingsby Skylark III, or perhaps the modified Olympia IV, and in the two-seater class either the second prototype T.42 or the Elliott-modified K.1." The technical committee regretted that it was still unable to grant a C. of A. to the Fauvel A.V.36, "since flight tests in France of a machine with a revised skid arrangement showed that its landing characteristics were virtually unchanged. It is still very easy to produce an uncontrollable bouncing motion."

Handling the Max Holste Broussard

A Successful French Bush Aircraft

By C. M. LAMBERT

THERE is always a demand for the type of aircraft which can land almost anywhere and carry anything from an expectant mother to a pile of assorted lumber from here to the nearest centre of succour or habitation. An excellent example of such an aircraft is the Max Holste M.H. 1521 Broussard, over 300 of which have now been ordered for the French Services. In fact, when civil sales were already going well, the French government decided that the military requirement was so urgent that they requisitioned all the Broussards so far built—and even some that had already been delivered to civil customers. The machines are required by the army for the transport of troops and supplies in North Africa and other areas where anti-terrorist campaigns are in hand.

Two machines have temporarily escaped requisitioning. One has been sent out to Australia, where, together with the Djinn helicopter and Noratlas transport, it is being demonstrated as part of the French contribution to this year's Sydney fair. The other, belonging to the fleet of the French Ministry of Public Works and Civil Aviation, is kept at Le Bourget. It is this machine which I was able to fly. It is one of the early production aircraft for the civil market and therefore carries none of the host of fittings and attachments which are provided in military versions for the carriage of stretchers and other special items; but it was otherwise quite standard.

The following figures will serve to situate the Broussard in the bush aircraft field as regards performance and capacity. It has the excellent Pratt and Whitney R-985 Wasp Junior, giving 450 h.p. which, at economic cruising power, gives a speed of 143 m.p.h. at the maximum aircraft weight of 5,511 lb. At this same weight, the take-off run to unstick is 607ft and the ground-run on landing 300ft. To clear a 50ft obstacle these distances are respectively increased to 1,066ft and 787ft. Minimum speed at full load is 53 m.p.h. The breakdown of the maximum weight is as follows: The empty equipped weight (counting only pilot's seat) is 3,263 lb, and to this are added 77 lb for radio, 121 lb for passenger seats, 660 lb for 94 gal of fuel and 55 lb for 5.8 gal of oil, 165 lb for the pilot, 825 lb for passengers and 342 lb for baggage or other items. The wing loading then comes out at 20 lb/sq ft and the power loading is 12.1 lb/h.p. The cabin dimensions are decidedly useful; volume is 170 cu ft, with a maximum width, total length and average height of 4.1ft, 10.15ft and 4.32ft. The double doors together measure 3.78ft by 4.2ft.

It can thus be seen that the Broussard is in many ways similar to the Beaver. The main external difference between the two lies in the Broussard's twin fins and rudders and its spring-steel undercarriage legs. The latter are made under American licence.

I flew the aircraft on a cloudless day when Le Bourget was almost deserted because of a 24-hour strike of traffic controllers; with me was M. André Gérard, chief pilot of the Ministry of Public Works and Civil Aviation. The cabin of this machine was arranged with two separate seats for the pilots and two bench seats for two people each in the main cargo space. The double doors open to expose the central section of the cabin—i.e., abreast of the central row of seats—and access is made easy by a large step and several handholds. The pilots move forward between the two front seats and have plenty of room when seated. On the ground the attitude is fairly sharply tail-down and the engine cowling juts straight up in front. The long sloping side-pillars of the windscreen at first seem to obscure vision in the three-quarter front direction, but during over an hour of flying and circuitry I did not in fact notice any inconvenience. Neither does the engine unduly obtrude into the field of vision. The cowling is quite narrow, and during taxying one does not really have to weave in order to keep the ground ahead in full view. One disadvantage is that the sharp curvature of the windscreen transparency at the sides leads to considerable distortion, and to some reflection from the inside of the cabin. This did not, however, interfere with landing or take-off.

Instruments and controls are all grouped well forward, with two sets of engine levers, one on each side wall, two control columns and rudder pedal controls, and toe-operated brakes for first pilot only. A full blind-flying panel is on the left, with A.D.F. and radio controls to the right. Some circuit breakers are on the left, together with magnetic compass, A.D.F. dial,

In the heading picture the Broussard is seen coming in to land with full flap applied. The attitude is not exaggerated and the elevator control remaining after the power is cut makes a smart round-out perfectly easy. Three-point landings are no trouble at all. Though in service with a Ministry this particular Broussard still bears the gay yellow and green trim it was given for a demonstration trip to Venice last year.

Though spindly in appearance, the undercarriage legs are efficient and simple. The sharply raked wind-screen gives a wide field of view.

HANDLING THE BROUSSARD . . .

magneto switch, flap switch (actuation is electric) and parking-brake toggle. Trim wheels for rudder and elevator are on a central pedestal. The flap indicator is a small pointer which moves down a graduated scale in the left-hand windscreen pillar. There are both petrol and oil cocks, on the left, but they are so linked that fuel cannot be turned on without also opening the oil cock. A good point is that diagrams of the fuel and oil systems are permanently attached to the cabin roof for easy reference in flight. The wing-tank fuel gauges are under the wing and the centre-section tank gauge is on the main panel.

Engine starting and handling are of the familiar Wasp Junior kind. As far as control goes, the airscrew is also standard. The combination of such a well-known and reliable engine with the excellent and absolutely straightforward handling qualities of the aircraft is particularly pleasant from the pilot's point of view. I found that performance left little to be desired. M. Gérard taxied out and lined up for take-off. He had the only brake pedals and there was some cross-wind, so I contented myself with timing the first take-off. It took nine seconds and 100 yd, and was followed by a good steep climb. We were carrying three people and a full fuel load. The climbing speed was 80 kt at 2,000 r.p.m. and 105 *pièzes*, and the rate was 1,000 ft/min.

I took over at about 1,000 m (3,200ft) with the Broussard settled into a cruise at 120 kt with 1,950 r.p.m. and 90 *pièzes*. I pulled the nose up about 15 deg and let go; the nose dropped slowly below the horizon, came up again about half as far as I had first pulled it and then settled back into the trimmed attitude. Meanwhile, a very slight roll developed in one direction as the speed fell off and in the other as it increased. Trimmed again, I kept my feet on the rudder pedals and applied left aileron. The aircraft rolled and the rudder moved momentarily against my feet; when I released pressure on the stick the aircraft reduced its bank angle to about 10 deg and went into a co-ordinated left turn. Results were the same in the other direction and with the rudder pedals free. Some rudder was required to initiate a turn in either direction, but the aircraft would then continue the turn without rudder, and did not tend to climb or dive or require fore-and-aft attitude adjustment to maintain constant height. Rudder trim was hardly required at all and the elevator trim was well geared, effective and easy to set. I did not find any flight condition, at that load, in which I ran out of trim.

We next tried the stall, first with the aircraft clean. Aileron control remained as the speed came right back to a stall at 53 kt indicated. There was good warning from low-frequency buffeting and the stall itself came in the form of a firm faltering and a slight pitch forward. The nose did not drop below the horizon and recovery was immediate if the stick was released. There was no indication of wing-drop, and no height-loss was shown on the altimeter. With full flap the stall was again the same, but the speed came back to 41 kt. At about 45 kt the aircraft could be flown comfortably and trimmed hands-off.

M. Gérard showed me an approach and landing. On finals he selected full flap and a trickle of power and at just over 50 kt, some 20ft up, he cut the power and proceeded to round-out firmly. There was no abrupt sink, and the aircraft clattered on to all three points and stayed down—certainly not a gentle arrival, but an extremely effective and apparently easy one. The ground run was about 150 yd without great use of brakes.

We then flew about for a time, allowing the photographer to take some pictures from the end of the runway. The second touch-down was excellently judged and there was no tendency to bounce despite the spring steel undercarriage legs and tarmac runway. I then tried a take-off myself, leaving the braking to M. Gérard as I had no pedals on my side. We were trimmed somewhat tail-heavy and I had to exert considerable force to raise the tail; but the Broussard flew off almost immediately and I trimmed into the climb. Raising of the one-third flap used for take-off required no readjustment of trim, though there were some trim-changes while the flaps were moving.

On the downwind leg I lowered one-third flap and trimmed out a slight nose-up change. Subsequent flap extension required no further trimming. On finals (which we had to drag out somewhat, in order to get in behind a Dakota) I found the visibility and control good at 60 kt. A useful feature was that the angle of descent could be regulated precisely by adjusting power without any noticeable change of attitude or trim. I reduced power in the last part of the round-out and, as the speed fell off steadily, pulled back on the stick and touched down in the three-point attitude without any difficulty. It is a particularly good point that elevator effectiveness does not appear to diminish at all as the power is cut, and one can really horse the stick back and get immediate and precise results. There is no need to "catch" the aircraft before it falls on to the main wheels when power is cut. Once down, the Broussard tends to swing on tarmac and must be held straight, and this I had to leave to M. Gérard. I could see no tendency to bounce, but it was said that a "wheeler" on tarmac with anything more than about half flap could lead to ballooning. Such a landing in this aircraft, however, would be quite pointless.

There were two points I did not very much like. One was the flap-control switch. It was too small and too stiff, so that one could not too easily get hold of it and tended to overshoot the neutral position and get the flaps moving in the opposite direction when simply trying to stop them at a given setting. This could be improved by making the switch lever longer, or by making the positioning springs less strong. The other point was the doors. They were excellently positioned and proportioned for loading, but difficult to open and shut. Flaps had to be raised before the rear half could be opened and there was a mechanical lock to prevent any attempt without such preliminary action. If the engine was running the rear door had to be carefully held, preferably from outside, to prevent it slamming hard against the rear fuselage side. The main locking handle was on the forward door and not too easy to manipulate. This might well have been a feature of this particular aircraft, and later models may be easier.

But the freight cabin of the Broussard is very good and, in the standard military version, a great variety of arrangements are provided for. There are obviously the alternatives of pure passenger or freight layouts, the seat attachment points being used for cargo tie-down in the latter case. In alternative layouts two stretchers can be carried, one above the other to starboard, leaving room for two seated attendants or "walking wounded." For aerial command post and spotting work the cabin can accommodate a complete H.F. radio installation in a rack, operated by a man seated facing rearwards. Behind the radio there are mountings for a vertical camera in the floor and an oblique camera "looking" through one of the side windows. Awkward loads which can be comfortably taken include 40-gallon fuel drums and a complete Wasp Junior engine. The aircraft as a whole is simple, robust and suitable for tropical operations.

As a flying machine I liked the Broussard very much, for it had excellent take-off performance, was quite viceless, showed very few trim-changes throughout the speed-and power ranges and was easy to fly and land. Considering the slow-speed performance, all this is quite an achievement. The success of the machine has been demonstrated by the very large military order and the civil orders which have so far resulted. Further sales will almost inevitably follow as soon as the military demands have to some extent been satisfied.

MAX HOLSTE MH 1521 BROUSSARD

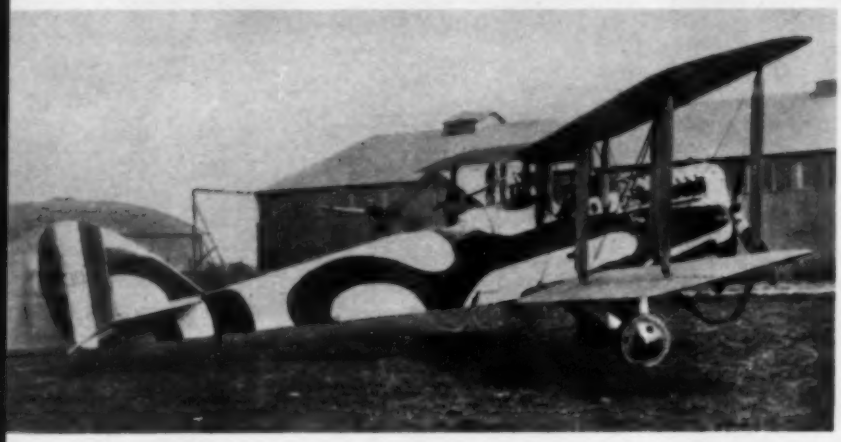
One Pratt and Whitney R-985 Wasp Junior, 450 h.p.

Span	45ft
Length	28ft 2in
Wing area	271 sq ft
Aspect ratio	7.5
Empty weight	3,263 lb
Maximum weight	5,511 lb
Wing loading	20 lb/sq ft
Power loading	12.1 lb/h.p.
Full-load performance	
Maximum continuous cruising	168 m.p.h.
Economic cruising	143 m.p.h.
Minimum speed	53 m.p.h.
Still-air range	745 miles
Take-off run	607ft
Landing run	300ft

The aircraft complies with I.C.A.O. specifications for Category D. Performance figures guaranteed by the makers to plus or minus 3 per cent.

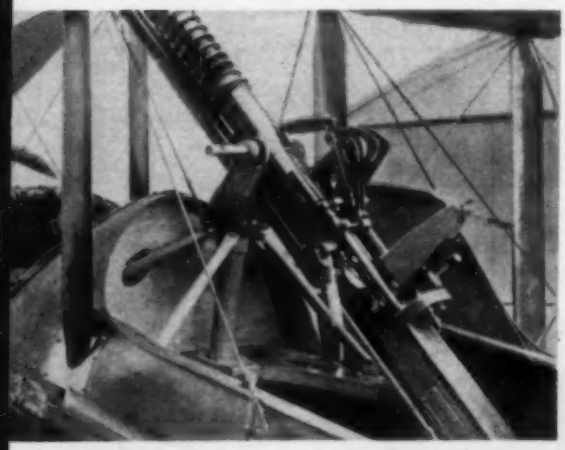
The Beardmore W.B.IV single-seat shipboard fighter had its 200 h.p. Hispano-Suiza engine mounted amidships, driving the airscrew by a long extension shaft which passed between the pilot's legs. The fuselage incorporated a built-in buoyancy chamber, and the wings could be folded.

(Below) An Eagle-powered D.H.4 with unusual camouflage. The observer's armament consists of two Lewis guns on individual pillar mountings, an arrangement which was used on some R.N.A.S. D.H.4s.



SINCE *Flight* began publication of the *Historic Military Aircraft* series of articles by J. M. Bruce (the next, incidentally, will concern the D.H.9) interest in the great, or otherwise extraordinary, machines of the First World War has been stimulated to a degree which has been plainly registered in our Correspondence columns. Many a half-forgotten fact or faded photograph has once again seen the light of day under the new stimulus, and occasional rarities—such as to surprise and delight even the deepest-dyed collector or specialist—have been saved for posterity. Now, from a private collection, come the choice items in these pages. Mostly taken at the Isle of Grain experimental station in the later years of the First World War and shortly thereafter, they have never (with one or two possible exceptions) been previously published. More than one, indeed, came as a revelation even to Mr. Bruce, author of the informative captions.

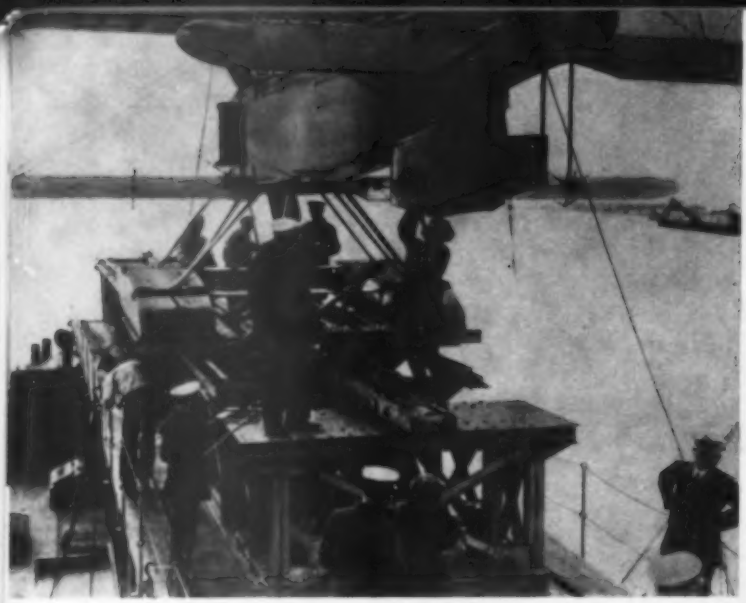
COLLECTORS' ITEMS



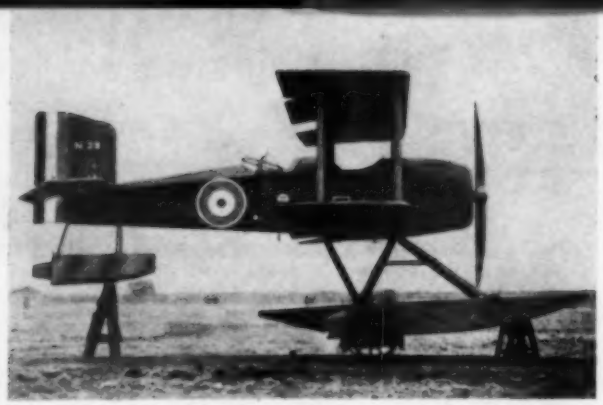
(Left) Installation of Coventry Ordnance Works 1½-pounder quick-firing gun in the rear cockpit of a D.H.4. Two machines were armed in this way for service as anti-Zeppelin aircraft. (See "Flight," October 17, 1952.)

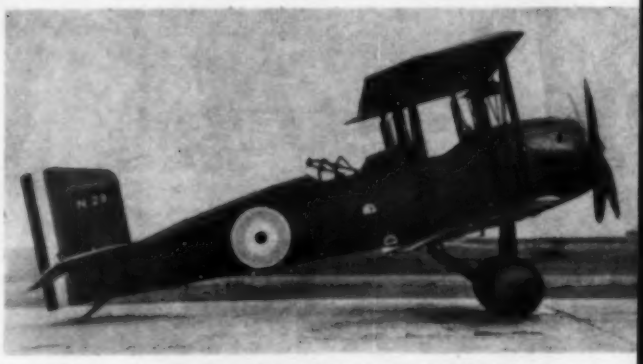
A D.H.6, presumably one of those used for anti-submarine patrol duties, powered by a 90 h.p. Curtiss OX-5 engine. It has negative stagger and the modified aerofoils which were introduced in March 1918 in an attempt to improve performance.

(Left) A D.H.9A fitted with Wight flotation gear. The undercarriage has been modified to enable it to be swung backwards to permit full air-bag development.



The Fairey F.127 seaplane (N.9) on the "Slinger's" catapult. Additional struts were fitted to the undercarriage bracing to strengthen the structure. Launchings were made with the flaps depressed a few degrees. N.9 was the first British seaplane to be catapulted.





(Top) The seaplane version of the Handley Page R/200 (200 h.p. Hispano-Suiza). This two-seat aircraft was intended for shipboard use; the mainplanes, which could be folded, incorporated variable camber gear. The machine was first flown from the Welsh Harp in 1917 by Gordon Bell. The R/200 had interchangeable float and wheel undercarriages, and N.29 appeared as a landplane, as seen in the second of these two views. It underwent its official trials in March 1918.

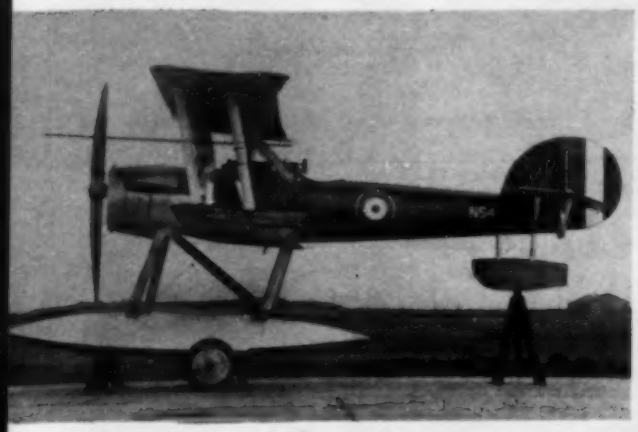
COLLECTORS' ITEMS . . .

The upper of the three machines on the left is the original Grain Griffin (200 h.p. Hispano-Suiza), which was a converted Sopwith B.1, seen here with hydrovanes and the narrow-chord ailerons which proved to be virtually useless. The next view shows the final form of Grain Griffin (200 h.p. Sunbeam Arab) incorporating extensive modifications. The fuselage and wings were completely redesigned; a horn-balanced rudder and broad-chord horn-balanced ailerons were fitted. (Bottom left) The unreliability of the Arab engine may have been responsible for the alternative installation of the 230 h.p. B.R.2 in at least one Griffin.

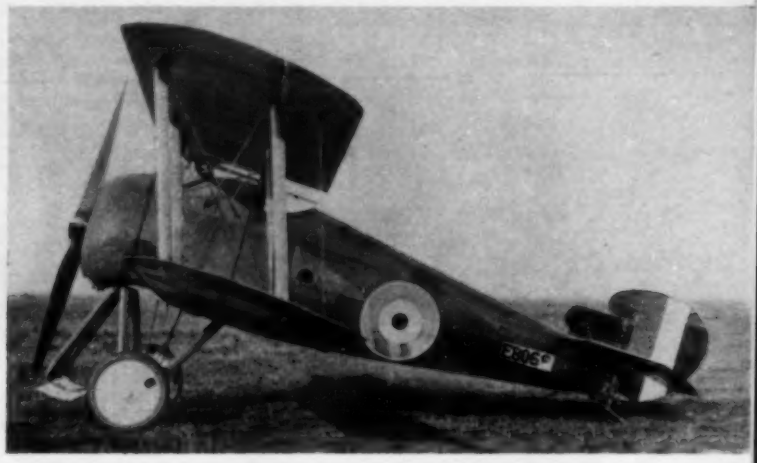
(Above) The Norman Thompson N.1B (200 h.p. Hispano-Suiza) was intended to be a high-performance two-seat fighting flying boat and appeared in September 1917. The excellent performance claimed for it by its makers was not realized in its official trials, however.

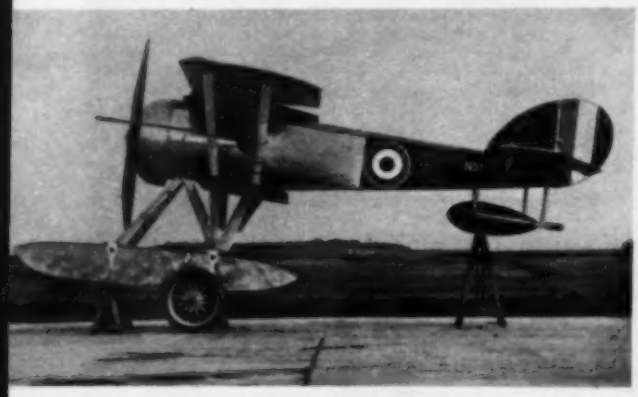
The Short Improved 184 (225 h.p. Sunbeam), right, had Martin stabilizers at the upper wing-tips. Apparently any deflection of the stabilizers in roll produced an opposing (i.e. righting) movement of the ailerons which were horn-balanced for lightness of action.

There can be little doubt that it was intended to replace the shipboard Sopwith Camels with Snipes. The Sopwith-built Snipe (second down, right) was fitted with a hydrovane in front of the wheels to reduce the risk of overturning on striking the water. It was tested in May 1919.

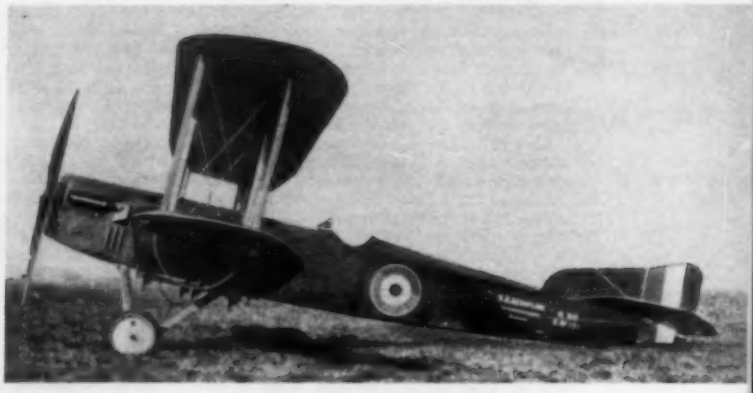


The equal-span Port Victoria P.V.5A (200 h.p. Hispano-Suiza) was built to provide comparative data for the sesquiplane P.V.5 (150 h.p. Hispano-Suiza). Both machines had been designed to have the 150 h.p. Smith static radial engine; none was available, however, and the Hispano-Suizas had to be substituted.

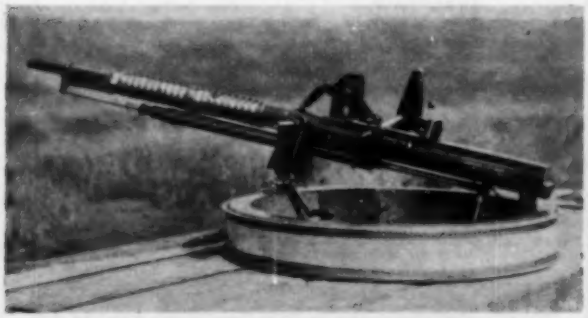




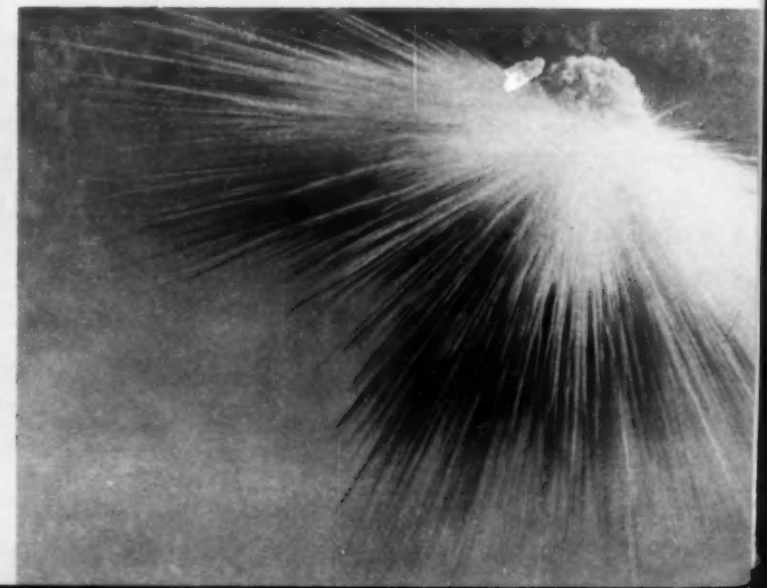
The Port Victoria P.V.9 (150 h.p. B.R.1) was the Experimental Construction Depot's last single-seat fighter seaplane; it was tested in May 1918. It was a sesquiplane of good design and useful performance. Maximum speed was 110.5 m.p.h. at 2,000ft.



The only aeroplane to be designed and built by the Sunbeam Motor Car Co. during the first World War was this single-seat bomber powered by the 200 h.p. Sunbeam Arab engine. It was apparently in the same class as the highly efficient, though little-known, Sopwith B.1.



The Coventry Ordnance Works 1½-pounder quick-firing gun on a ring-mounting. (Right) The bursting of a large smoke bomb dropped from an aircraft. Bombs of this type were intended to produce smoke screens for the concealment of ships at sea. (See "The Great War," Ed. H. W. Wilson, Vol. XIII, page 121.)



"Flight" photographs

Seven Canberra B.6s, taken from squadrons and factory and modified, lined up at Weston Zoyland ready for departure. Extra aerials in evidence for H.F. radio and D.M.E. are intended solely for navigation in Australia. (Right) The task force commander, G/C. S. W. B. Menaul.

ATOMIC TASK FORCE

Air Support for Atomic Tests in Australia

AN air task force has been specially formed for the British atomic weapon tests which are soon to be carried out in Australia. For the first time a complete and independent force has been provided, so that the scientists can have the aircraft which they now need to gather certain information about the explosions and their consequences.

Under the command of G/C. S. W. B. Menaul, the force commander, aircraft and personnel began to concentrate at Weston Zoyland, in Somerset, last November, and training flights with Canberra B.6s and Varsities began. Altogether 24 aircraft and 500 personnel are involved, the men being for the most part volunteers and the aircraft including Shackletons, Canberras, Varsities, Hastings, and Whirlwind helicopters. In some cases National Servicemen volunteered to extend their period of service in order to accompany the force. The duration of the stay in Australia will depend mainly upon the progress of the tests, and these must wait upon weather and other contingencies.

One of the features of the operation is that it has to be mounted at the end of a 12,000-mile supply line along which the aircraft themselves have first to travel. The Shackletons went out beforehand and are already being used for meteorological survey of the area north of Darwin from which the troublesome "Willy Willy" storms may come to upset weather. Ideal weather conditions are, of course, essential for proper observation of results. The Whirlwinds also are already there, having been shipped by surface transport, and the three Varsities left during last week to fly to Pearce airfield, South-West Australia, where the force will concentrate during next week. They are staging through, among other places, Abu Sueir, Habbaniya, Mauripur, Calcutta, Changi and Darwin. The Canberras are flying in two groups, one of four and the other of three aircraft, stopping only at Idris, Habbaniya, Mauripur, Negombo, Changi and Darwin. Hastings are accompanying them with ground crews and spares. Charter aircraft are taking out those people who are not already with the force aircraft.

For the first tests in the Monte Bello islands, several landing grounds and airfields in the area will be used, and Hastings, Varsities and Whirlwinds will provide communications transport. Australian Neptunes will patrol and clear the surrounding sea areas of shipping. No official comment is forthcoming on the question of whether any V-bomber will take part in the tests. The main task of the Canberras will be to fly through the cloud as and when requested by the scientists, in order to gather air samples in special filters. They will also help to track the cloud as it drifts along. For protection against radioactivity the Canberras are fitted with filters in the air-conditioning and pressurization systems, and crews will wear only air-ventilated suits and no special protective clothing. Aircraft will be decontaminated on the ground by airmen wearing special suits and masks. Other modifications to the Canberras include the fitting of H.F. radios and D.M.E., simply because these are necessary for navigation in Australia.

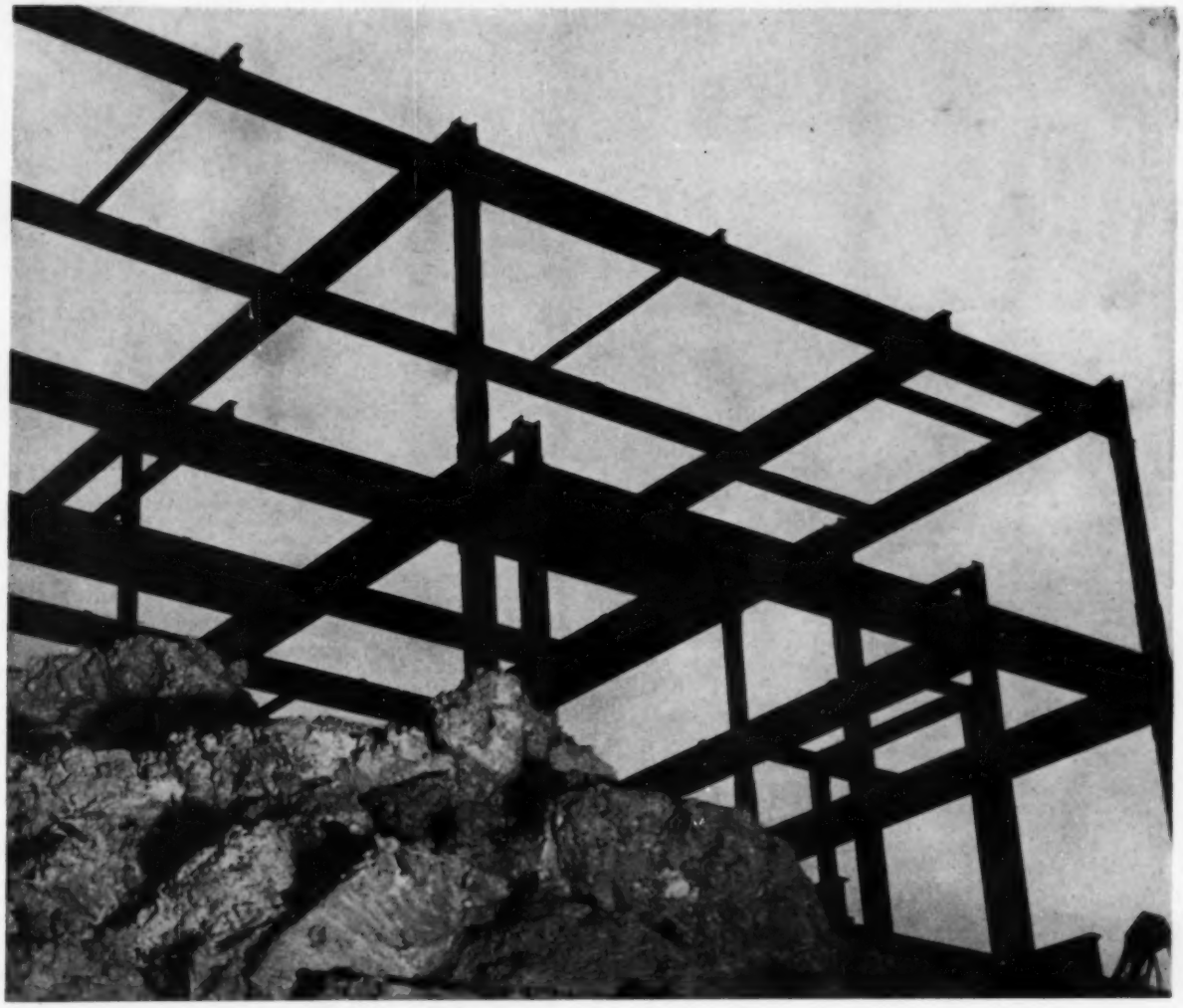
Varsities and Whirlwinds will be used to survey the crater and measure ground conditions after the explosion, and for general work at low levels. One of the task force's duties will be to check the whole test area to ensure that it is no longer dangerous in any way. It is the expressed intention to leave the area "as clean as we found it" after the tests.

Most of the aircraft of the force will stay on in Australia to help the scientists with the second series of tests, which will take place at the new ground at Maralinga, about 400 miles from Adelaide. It is stated that as many crews as possible will be allowed to observe the explosions while airborne in order to give them familiarity with these unpleasant phenomena. In this way the R.A.F. will gain considerable experience of atomic operations, though the primary purpose of the task force is simple to provide an aerial source of information for the scientists. No information has been given about the type of weapons to be exploded, nor of the way in which they will be detonated.

The three Varsities which will be used in Australia for tracking the radioactive cloud and fall-out at the lower altitudes, and for communications flying. "Flight" photograph

FORTHCOMING EVENTS

Mar. 23. Society of Licensed Aircraft Engineers (London): "Development of the Rolls-Royce Dart Engine," by J. Wood, B.Sc., A.F.R.Ae.S.
Mar. 24. Air-Britain: Annual General Meeting.
Mar. 24. British Interplanetary Society (Bristol): "Mars," by P. Moore, F.R.A.S.
Mar. 27. R.Ae.C.: Annual General Meeting.
Mar. 28. R.Ae.S.: Graduates' and Students' Section: "Artificial Space Satellites," by A. V. Cleaver.
Mar. 28. British Interplanetary Society (Edinburgh): "Space-ship Engineering," by P. H. Tanner, B.Sc.
Mar. 28. British Institution of Radio Engineers: "Problems of Secondary Surveillance Radar," by K. E. Harris.
Mar. 29. Derby and Lancs Gliding Club: Annual Dinner and Dance.
Mar. 30. British Interplanetary Society (Glasgow): "Space-ship Engineering," by P. H. Tanner, B.Sc.
Apr. 4. Air-Britain (London): Presentation of B.O.A.C. Recognition Trophy.
Apr. 6. R.Ae.S.: "Problems in Production and use of Modern Light Alloys," by G. Forrest, B.Sc.(Eng.), A.F.R.Ae.S., (at Belfast).
Apr. 6. British Interplanetary Society (Harrogate): "Speculations on Extra-terrestrial Life," by S. S. Kind.
Apr. 7. British Interplanetary Society: "Power Supplies and Telemetry for Instrument-carrying Artificial Satellites," by J. Foley, B.Sc., F.R.Ae.S., Grad.I.Mech.E., E. White and R. Wilkins.
Apr. 12. R.Ae.S. Section Discussion: "Aircraft Interior Layout."
Apr. 13. Helicopter Association: "Aerodynamic Aspects of Helicopter Design," by H. Roberts, Ph.D., B.Sc., D.I.C., A.F.R.Ae.S., A.M.I.Mech.E.
Apr. 14. Surrey Gliding Club: Annual General Meeting.
Apr. 14. London Gliding Club: Annual Dinner Dance.
Apr. 14. British Interplanetary Society (Birmingham): "Astronautics Today," by R. B. Beard, Grad.I.Mech.E., Grad.I.Prod.E.



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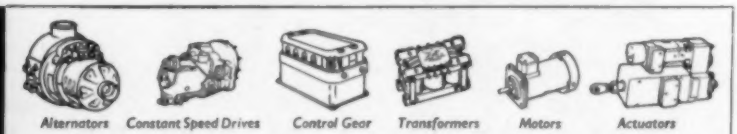
'ENGLISH ELECTRIC' aircraft equipment



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Trooping · Minesweeping · Communications
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in production

Following the world-wide interest provoked by the outstanding performance of the Westland Widgeon during its first appearance at Farnborough last year, Westland, in accordance with their traditional policy of anticipating demand, have put an initial batch of this latest, all-purpose Helicopter in production.

Designed to meet all that is required of a medium weight and versatile Helicopter for military and civil needs, and incorporating in its construction many well tried and highly successful components and engineering features, the Widgeon's standard accommodation is for four passengers and pilot, or two stretcher cases, medical attendant and pilot.

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Dragonfly *Whirlwind* *Widgeon*

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EFFICIENCY IN CROP SPRAYING

Claims of the Rotary Atomizer

By F. R. J. BRITTEN and N. D. NORMAN

A test run by a Tiger Moth fitted with two rotary atomizers of the type described in the article. Spraying rate is here 0.6 gall./acre; the wing-tip vortices are spreading the spray stream into a wide swath.

THIS article describes a new form of rotary atomizer, for crop-spraying, which has been developed by the authors. The possibility of its use in connection with the two new British agricultural aircraft, the Auster B.8 Agricola and the Edgar Percival P.9, is currently being investigated.

ONE of the aviation landmarks of 1956 will undoubtedly be the new British aircraft that have at last been built specifically for the specialized requirements of agriculture; and there is little doubt that in the years to come these aircraft or their successors will replace altogether the converted dual trainers and light aircraft which had to be pressed into agricultural use over the past decade to give aerial spraying contractors a practical implement.

These new designs will have a work capacity far beyond that of the old converted aircraft and the savings in chemical application costs which they offer will broaden the scope of agricultural aviation throughout the world.

Unfortunately, the care and thought now going into the design of aircraft have not been paralleled by research into the agricultural equipment which is fitted to the aeroplane. In fact, conventional aerial spraying apparatus is little more than an adaptation of the boom-and-nozzle rig which the farmer tows behind his tractor on the ground. Little attempt has been made to take advantage of certain characteristics peculiar to aeroplanes by developing special apparatus and techniques to suit them. Indeed, the design of aerial spraying equipment seriously lags behind the progress in both chemicals and aircraft.

Chemicals now used for agricultural or insecticidal work are generally so powerful that only very small quantities are required for treating large areas. A typical D.D.T. treatment involves less than one pound of the chemical per acre; but such small quantities of chemical must be evenly dispersed through the area under treatment. To achieve this even cover a chemical is usually diluted with a substantial amount of neutral carrier, which may be liquid or solid.

Clearly, the amount of work which a spraying aircraft can perform in a given time is a function of the amount of chemical and diluent which can be carried and the rate at which it is released. It follows that the economic capabilities of the aircraft can be greatly increased if smaller quantities of more concentrated chemical can be used while still giving effective coverage.

This is in fact now being achieved by a new approach to the design of spraying equipment which has resulted in the development of rotary atomizers. These permit a reduction in the diluent liquid which has to be carried and so increase the work capacity of each aircraft. Atomizers of the "Micronair" type* have been fitted on Tiger Moths, and used for extensive cotton spraying in the Sudan†; these operations demonstrated conclusively that the desired coverage would be obtained using only a fraction of the liquid normally dispensed by aircraft fitted with conventional spraying equipment.

Principles of Low-volume Spraying. To assess the efficiency of any particular spraying operation three factors must be considered—the droplet size, the number of droplets and the strength of chemical. An important point is that the volume of a droplet varies with the cube of its diameter. For example, the drip from a bath tap measures about 3,000 microns in diameter. If this large drop were atomized into droplets of uniform 300 μ size, one thousand droplets would result; at a uniform diameter of 75 μ, 64,000 droplets could be produced. If effective treatment required a cover density of 500 droplets per square inch, the volume of liquid in the tap drip sprayed in droplets of 300 μ would account for 2 sq in. If this amount of liquid was sprayed in droplets of 75 μ at a similar cover density, 128 sq in, or 64 times the area, could be treated, provided the chemical solution were made 64 times stronger. Fig. 1 shows influence of droplet size upon cover.

The Droplet Spectrum. In order to make the optimum use of the spray liquid, it should be atomized into droplets of uniform size and the diameter should be the minimum consistant with effective treatment. In practice, the droplets produced by a nozzle vary in size over a wide range. Typical examples of nozzle performance are shown in Fig. 2.

All droplets above and below the selected size-band—say plus or minus 10 μ of the mass median diameter, are wasteful. For example, only 21 per cent of the liquid forced through the typical "flat spray" nozzle is used to its best advantage if the desired droplet size is 110 μ. However, with the Micronair atomizers as much as 90 per cent of the liquid is atomized into droplets within this size-band when the atomizer is set accordingly.

The mass median diameter obtainable with the Micron atomizer is adjustable within broad limits. The curve shown in Fig. 2 represents the finest spray actually used in the Sudan, and in this case 70 per cent of the spray was within plus or minus 10 μ of the 46 μ m.m.d.

Choice of Droplet Size. Many factors effect the choice of droplet size. Small droplets (1) give a denser cover; (2) eliminate losses by "drip off" from the edges of leaves; (3) reduce danger of leaf-scorch from phytotoxic liquids. On the other hand, larger droplets

**Developed and manufactured by the authors' company, Britten-Norman, Ltd., Star Street, Ryde, Isle of Wight.*

†These operations were by Crop Culture (Aerial), of Wright's Lane, Torquay.

Fig. 1. The influence of droplet size on area covered. The curve is based on a spraying rate of one gallon per acre.

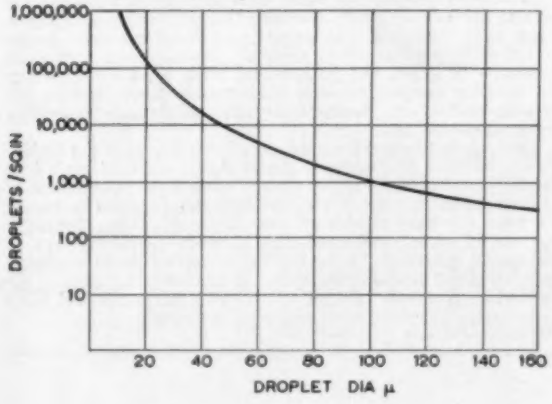
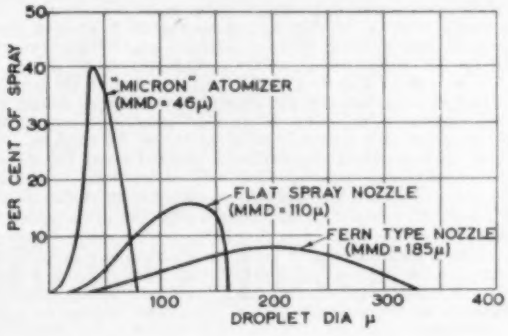
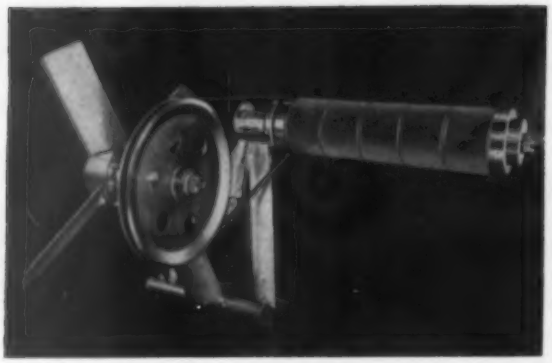


Fig. 2. Typical droplet-size spectra for rotary atomizer (finest spray) and two types of nozzle. "Micron" droplet size is variable.





The "Micronair" fan-driven rotary atomizer. Liquid fed on to the rotating cylinder (4in diameter and 14in length in this example) is thrown off the periphery in droplets of uniform size.

EFFICIENCY IN CROP SPRAYING . . .

give (1) reduction in droplet surface area and so reduce losses by evaporation; (2) reduction in loss by drift. The chemical treatment involved may also place limitations upon the droplet size.

Experience with the Tiger Moths in the Sudan has shown that a spray composed of droplets as small as 46 μ can be successfully applied on crops from aircraft even in high winds.

Rotary Atomization. The working principle of all rotary atomizers is that liquid fed on to a spinning disc will be thrown off the periphery in droplets of uniform size—provided the liquid has attained the disc's full circumferential speed. The droplet size is controlled by the diameter of the disc and its r.p.m. Practical application of the spinning disc for agricultural spraying is severely limited by the low feed of liquid possible before "slip" takes place and rotary atomization breaks down.

Mutliple spinning discs and brushes have been tried, but, due to slip, true rotary atomization with this equipment is not possible at the rate of feed usually required in commercial spraying work. The surface of the rotating cage of the Micron atomizer maintains rotary atomization up to a feed of several gallons per minute. Atomizing capacity is a direct function of the surface area of the cylinder, a typical example being 4in in diameter and 14in long. The atomizers are driven by windmills and the blades are adjustable to give the desired r.p.m. and droplet size. Normal atomizer speed is 10,000-15,000 r.p.m.

Effect of Wing Vortices on Swath. On a light aircraft only two of the atomizers need be fitted. These are placed at the wing tips, so that the tip vortices spread the spray stream into a wide swath. With a Tiger Moth operating in still air, swath width proved to be about 60 yd, e.g., six wing-spans. This remarkably wide swath develops because the small droplets have negligible inertia and are therefore readily carried by the disturbed air of the vortex. For crop spraying a flight spacing of 20-30 yd proved desirable, so that the area treated was sprayed at least twice and an even cover was guaranteed.

A very important effect resulting from the use of only small droplets is the excellent under-leaf cover attained, the spray being worked right into the crop by the aircraft turbulence.

Drift Spraying. With conventional equipment, the uneven droplet spectrum emitted is often said to be an advantage when using drift spraying or cross-wind techniques. The larger droplets land almost beneath the aircraft, whilst the smaller droplets fall more slowly and carry farther down-wind. This effect gives the very wide swath desired. In fact, however, efficiency suffers because of the unevenness of the cover achieved. At the up-wind end of the swath cover is poor, as it is composed of limited numbers of large droplets; down-wind, density of cover improves until a point is reached beyond which the large numbers of small droplets no longer contain sufficient chemical to be effective.

However, with the Micron equipment a much more even cover is obtained over a wider effective swath-width. This is brought about by the vortex effect, which spreads the spray stream in the vertical sense. The droplets in the lower part of the vortices land immediately beneath the aircraft, while those above are carried progressively farther down-wind proportionately to the height to which they were originally carried by the vortices. The eliptical cross-sectional shape of the swath formed by the tip vortices results in a very even "fall out" of droplets.

Since the droplets are exposed to evaporation in the air for a varied period, a carrier liquid having a low volatility is desirable.

Space Spraying. Space spraying is the term applied to operations such as spraying insecticide upon or within swarms of flying locusts. The object is to fill the maximum air space with a spray or mist of lethal droplets. Here again uniform droplet spectrum is desirable to ensure production of the largest number of lethal droplets from the available spray liquid. If 50 μ droplets will do the job it is exceedingly wasteful to use oversize droplets. The dispersion of the spray stream emitted from the atomizers mounted in the wing vortex substantially increases the amount of lethal air space on each spraying pass.

Performance in the Field. Field trials upon cotton crops in the Sudan, using Tiger Moths fitted with Micron rotary atomizers set to produce 80 μ droplets, showed that about 90 per cent of the liquid sprayed was in droplets of plus or minus 10 μ of the desired size. The test was made with microscope slides placed at ground level, half way up the plants and towards the tops of the plants. Samples of the spray were also taken upon hand-held slides as it was leaving the wing-tip; these confirmed the droplet samples taken within the crop.

With the atomizers set to produce 46 μ droplets, control was less precise because of the minute size of the droplets, and the varying length of time for which they were exposed to evaporation whilst in the air. It was found that 70 per cent of the liquid sprayed was in droplets of plus or minus 10 μ of the desired size. The dense cover achieved was remarkable when less than a quart of liquid (0.2 gal) per acre was sprayed in droplets of this size. An average deposit of 1,800 droplets/sq in was recovered throughout the crop. Underleaf cover was 30 per cent. This figure for underleaf cover is the highest yet recorded for spray applications from fixed-wing aircraft and equals the best recorded figure for helicopter spraying. This particular treatment gave successful insect control.

In service the equipment was completely trouble-free. During the first few days of operation the atomizers were stripped and cleaned at the end of each day's work, and ball and roller races were repacked with grease. As experience was gained, these daily inspections were discontinued and, for the last few weeks of spraying, the operations of stripping, cleaning and greasing were abandoned altogether.

No blockages were experienced in the spray rig, although the chemical used was pumped straight into the aircraft from drums, unfiltered. The only filter used in the plumbing of the aircraft is a coarse-mesh "spanner catcher" filter in the filler neck of the chemical tank. The reason for the lack of blockages of a kind so often experienced with aircraft spraying systems is the absence of any small constrictions in the atomizers and plumbing.

Installation in the Tiger Moth. In the Tiger Moth equipment, the spray liquid is fed by gravity to a windmill-driven centrifugal pump placed beneath the aircraft. From the pump the liquid under pressure is released to the wing tips *via* an on-off cock and a "T" connection, or recirculated to the chemical tank through a gate valve. Pressure in the system is adjusted by varying the flow through the gate valve, which is controllable by the pilot. A pressure gauge is fitted in the cockpit. Spring-loaded pressure shut-off valves are positioned at the atomizers and are set to close when the pressure at the wing tips falls below 10lb/sq in, thus ensuring a positive, drip-free shut-off.

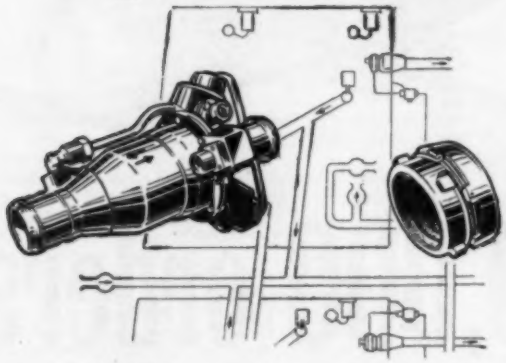
The pump and valves are standard commercial components. The tank fitted in the aircraft is a synthetic rubber bag clipped into the fertilizer hopper of a standard topdressing conversion of the Tiger Moth as supplied to New Zealand. A levered-float-type contents gauge calibrated from 0 to 65 gal is fitted.

Spraying with the Tiger Moth. The Tiger Moth sprayers showed up well in Sudan operating conditions. Although a fine-pitch airscrew was fitted there was no evidence of engine overheating. Thirty different pump schemes (privately owned cotton-growing projects) along the Blue and White Nile were sprayed, and no special landing strips were required. The low-pressure tyres enabled landings and take-offs to be made safely from unprepared open ground close to the cotton field.

Experience proved that pilots soon acquired a technique for judging the necessary drift allowances for satisfactory spraying in winds up to 20 m.p.h. The aircraft were flown at a wheel height of about 5ft over the crop, although results proved that small variations in height had no apparent effect upon cover. When the wing-tip installations were inadvertently flown through tall grasses, bushes, etc., during spray runs, no damage to rotating components occurred.

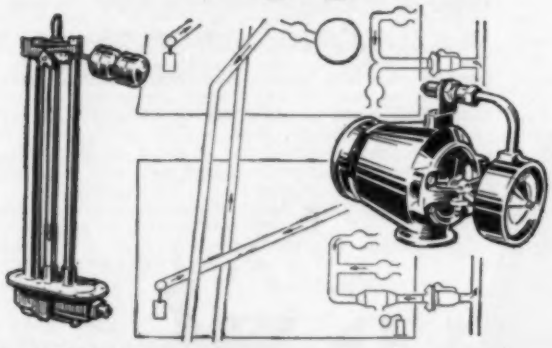
Two points emerged from the experience gained in the Sudan. Firstly, effective crop spraying can be carried out with much finer droplet sprays than are conventionally used; with the exception of fogging apparatus, conventional methods of application in current use have not been capable of such fine atomization. Secondly, the use of small, uniformed-sized droplets opens the way to substantial reductions in the volume of carrier liquid necessary for a successful chemical treatment. In practice a reduction in the application rate from two gallons to half a gallon per acre more than doubles the daily work output of an aircraft.

a complete fuel system



Since pressure fuelling became essential for the majority of aircraft, further developments have taken place in aircraft design which now make it desirable for fuelling, defuelling and engine feed systems to be treated as a common problem. For refuelling in flight or on the ground the system is the same; only the filling point is different.

from filling point to fuel tanks



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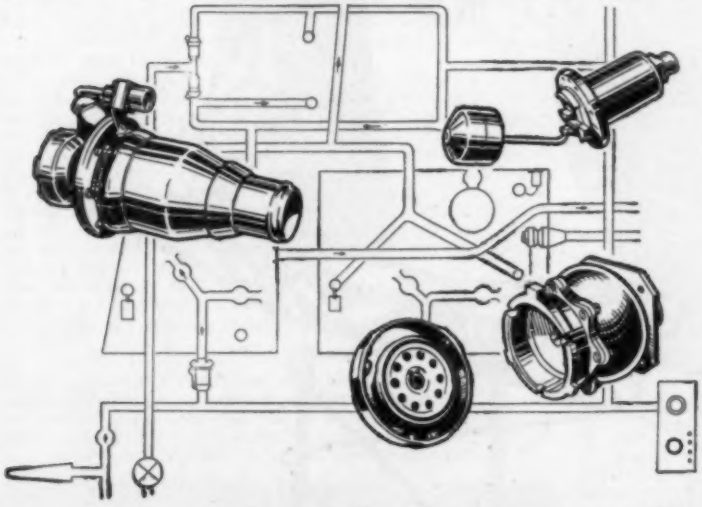

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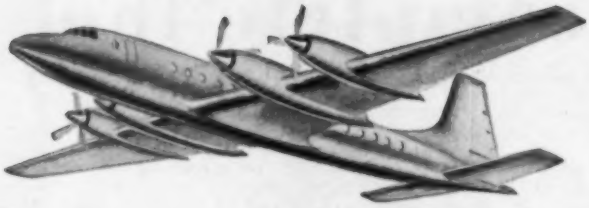

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CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

"A British Gliding Pioneer"

IN the interesting short article [March 9th] by Peter Brooks on the work of Pilcher, the author notes that Pilcher made many experiments with Hargrave kites.

The two men corresponded for some years. I am engaged at the moment in studying the most remarkable notebooks which Lawrence Hargrave kept for forty years. They are now in the safe keeping of the Royal Aeronautical Society and shed much light on the years before the Wrights flew.

It may be of interest to quote from a letter Pilcher wrote on June 25th, 1896, following a suggestion from Hargrave that his cellular kites were more stable in gusty weather than Pilcher's gliders. The letter is addressed from the experimental department of Hiram Maxim, where Pilcher was working at the time. The relevant quotation is:—

". . . we are rather at cross purposes. With your kites you naturally aim at stability, but with my soaring machines, stability, strange as it may appear, is a thing that I am very much afraid of. I like to have the machines practically neutral so as to be perfectly under control, or rather, more susceptible to the control movements of my body. For instance, if a soaring machine is stable transversely, either by having the wings at a dihedral angle, or by having the wing surface considerably raised above the centre of weight, although stable and stiff with the wind coming directly from ahead, if the wind shifts ever so little to the one side it must necessarily have a capsizing tendency, and this capsizing tendency will vary directly, and not inversely, as the transverse stability."

Hargrave wrote a long letter in reply, defending his ideas on stability. I only quote, however, "In working a flying machine the fewer things a fellow has to think about the more chance he will have of being successful. . . . I cannot see what you want with susceptibility to the movement of your body. I should think that was something to be avoided."

I should think so, too—not being a tight-rope walker, which so many early gliding experimenters were.

Brighton, Sussex. J. LAURENCE PRITCHARD.

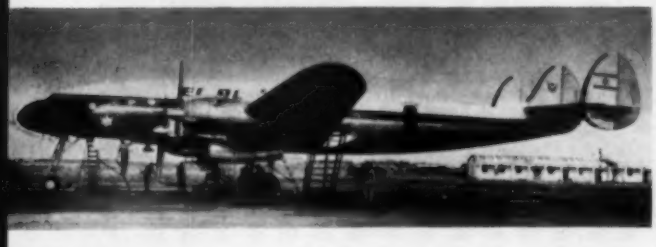
Airline Fleet Data

CONGRATULATIONS to the Editor and staff of *Flight* for what they have accomplished in publishing "Fleet Register" (page 76, January 20th issue) together with "Order Book" (page 61, January 13th issue). No other aviation journal—to the best of my knowledge—has previously published, in such concise and "easy reference" form, such thoroughly useful airlines data tables relating to all the post-war American transports in service and those on order for the world's airlines.

I'm sure you will forgive me if I take the liberty of pointing out a very small number of minor errors in the Connie 049/749 series and also the Convair 240 series charts. The two 049 Connies you show as owned by Campania Cubana de Aviacion were sold in October 1955 to El Al, and both are now flying with the Israeli airline as 4X-AKE and 'KF. Before being put into service by El Al both aircraft underwent extensive overhauls (including cockpit and passenger cabin seating modifications) at the Lod engineering base. I understand each airframe had logged some 25,000-plus hours when sold: in fact, these two 049s were originally part of P.A.A.'s fleet of eighteen 049s back in 1946! I cannot quote their constructor's serial numbers, but they were undoubtedly amongst the first batch of 049s built in 1945-6.

Thus the total number of 049s owned by El Al is five, because 4X-AKC (one of the original fleet of four) was destroyed in the tragic shooting-down of this aircraft by Bulgarian fighters and ack-ack on July 27th, 1955.

The Israel Airlines' Constellation which was shot down by two Communist fighters in July last year with the loss of all on board. Originally a Series 049 it was later converted by Lockheed to the 149 series. Built in 1944, it was the sixth production machine of its type. Acquired by El Al in 1951, it flew some 9,000 hours in their service.



An 049 operator omitted from your list is Pacific Northern Airlines Inc. of Seattle. Since January 1955 they have operated three of these aircraft on their Alaskan network of services (plus two DC-4s and four DC-3s). Again, these Connies are ex-P.A.A. and I understand they have been leased to P.N.A. for about three years.

Although, strictly speaking, Pan-American are no longer regular operators of Connies, they still have five 049s in their huge fleet of transports. These Connies are based at Miami and are, I understand, occasionally operated as "relief aircraft" when special occasions demand. They are also made immediately available for leasing to P.A.A.'s many associates in South America when required during peak traffic periods.

Against AVIANCA (Colombia) in your 049/749 chart should have appeared the figure "one" under the 749 column.

In the Convair 240 chart you show Orient Airways of Pakistan as owning three. Early last year this airline was absorbed by Pakistan International Airways and the three 240s, together with Orient's fleet of 11 DC-3s, were taken over by PIA.

In conclusion, for the benefit of other statistically minded *Flight* readers, a postscript to my "Constellation Saga" notes (page 106, January 27th issue). The total number of passengers carried by the Qantas former fleet of six 749s is 118,885—an average of just under 17,000 per annum for almost seven years. Not, perhaps, spectacular figures compared by other major international airlines, but none the less a very fine show by Qantas taking all factors into consideration on two of the longest air routes in the world—Sydney/London and Sydney/Johannesburg, on which these aircraft were mainly employed.

As a matter of historical interest I enclose the last photo taken of the ill-fated 4X-AKC (at Lod airport).

Nairobi, Kenya. DENNIS M. POWELL.

Canadian Pioneers

IN your issue of January 20th, 1956, you gave a very interesting résumé of Mr. N. E. Rowe's presidential address to the Royal Aeronautical Society. On page 72 there is a list of some early aviators; but once again—and this is becoming increasingly noticeable—the names of two pioneer Canadians, Baldwin and McCurdy, are missing.

Dr. Graham Bell's Aerial Experiment Society was formed in 1907 at Baddeck, Nova Scotia, with Baldwin, McCurdy, Glen Curtiss and Lt. Selfridge. The scene of operations was later transferred to Hammondsport, N.Y., to be near the Curtiss engine shop, and at this location several successful aircraft were built.

F. W. (Casey) Baldwin, by his flight with the *Red Bird* on March 12th, 1908, near Hammondsport, N.Y., became the first Canadian and citizen of the then British Empire to fly. Then, in December, 1908, J. D. McCurdy was the second Canadian to fly; and later, at Baddeck, N.S., on February 23rd, 1909, he became the first Canadian to fly in Canada. The fact that some of the flights were made in the United States may account for the oversights.

I think it can also be claimed that Baldwin first suggested the practical use of the aileron ("little wing") a name used by a French aviator in New York when McCurdy explained what they were doing.

Toronto, Ontario. T. R. LOUDON.

Dingbat Venture

I AM hoping to form a small syndicate of the Popular Flying Association, affiliated to the Pioneer Flying Group. It will be called the Dingbat Syndicate, as I hope to rebuild the Dingbat ultra-light single-seater aeroplane, which I can acquire complete with a 55 h.p. Lycoming engine, and airscrew, for about £50.

The aircraft was designed to take the 32 h.p. Carden-Ford engine, but was very underpowered; it is complete, but needs the necessary modifications to fit the Lycoming engine. The airframe is in quite good condition and quite a lot of work has been done on the aeroplane in the past.

We now require some amateur constructional members, who are keen on both construction and flying. They should contact me at the Popular Flying Association Group No. 50, 10 Woodnook Road, Streatham, London, S.W.16 (Streatham 8615).

London, S.W.16. ROGER BAILEY, JR.

THE INDUSTRY

In the Bag

AS readers of *Flight* will be aware, the air element of the Hunting Aerosurveys expedition to the Graham Land Peninsula includes two S-51 helicopters owned by Autair, Ltd. The two aircraft made the 8,000-mile voyage in the expedition vessel *Oluf Sven* (which has a helicopter flight deck), and an interesting system of packaging was employed to make certain that the S-51s were protected from corrosion *en route*.

R. and J. Park, Ltd., the London firm of packers and shippers, and British Visqueen, Ltd., an I.C.I. subsidiary company, were responsible. The helicopters were broken down into four principal component units and wrapped in "Visqueen" polythene film. The film was heat-sealed to ensure that the bags would be free from humidity, and the parts were then crated. About 2,000 sq ft of film was used for each helicopter. The wrapping was completed during a period of about four days.

One of the helicopters is now flying members of the survey team from the ship to the mainland—often over 300ft-high ice cliffs which would be otherwise impassable. It will be re-sealed in "Visqueen" for the return sea trip. The second aircraft is remaining in its container throughout the operation as a reserve machine and, it is hoped, will not be unpacked until the survey expedition returns to England in May or June.

Three members of a team which is to form the nucleus of a helicopter unit at the Winnipeg factory of Bristol Aircraft (Western), Ltd., Canada: (l. to r.) W. E. Robinson (chief engineer), V. Dutton (dynamics engineer) and S. Henshaw, a draughtsman hitherto engaged on helicopter work at Bristol's London drawing office.

Appointed to H.P. Sales Staff

NEWLY appointed to the sales staff of Handley Page, Ltd., is W/C. H. W. H. Fisher, D.F.C., who has joined the company after 17 years' service in the Royal Air Force. Educated at Wesley College in Western Australia, he studied mining engineering before entering the Service, in which he was commissioned in 1939. During the war he served in Bomber Command on Hampdens and Lancasters and commanded No. 57 Squadron. Later he became chief flying instructor at Cranwell. After the war he was appointed Inspector of the Royal Iraqi Air Force and was subsequently in the office of the Deputy Director of Air Foreign Liaison at the Air Ministry. W/C. Fisher was later given command of the Arab Legion Air Force, and was pilot to three kings and to the royal family of Jordan. For his services in this connection he was decorated with the Order of Independence. He retired from the R.A.F. at his own request to take up his new appointment.

W/C. Fisher.

Joining Shell-Mex

AS briefly announced in our "Industry" page last week, Mr. V. C. Varcoe, O.B.E., has been appointed aviation sales manager, head office, Shell-Mex and B.P., Ltd., in succession to Mr. J. C. C. Taylor, M.B.E., who retired from the company at the end of last month. Mr. Varcoe, who is particularly well known throughout the aviation industry, has had long experience in the aeronautical world. Born at Croydon and educated privately, he was apprenticed to Clement-Talbot, the famous car firm. In the 1914-18 war he learnt to fly at Northolt and served with the Royal Flying Corps, and subsequently the Royal Air Force. He was a pilot with the Independent Air Force, which bombed German towns with 120-lb and 250-lb bombs, dropped from D.H.9s and D.H.9As. At the end of the war he was with 99 Squadron, which took over the task of flying mail between Folkestone and Cologne—the forerunners of civil aviation. After five years of motor engineering in India Mr. Varcoe joined Shell-Mex, Ltd., as a superintendent at Horsham in 1925, continuing after the merger with the old British Petroleum Company as assistant to the manager of the motor oils department. By 1939 he was assistant manager, London South branch.

Mr. V. C. Varcoe.

In the 1939-45 war Mr. Varcoe had a particularly distinguished R.A.F. career. Attached to Bomber Command Headquarters Intelligence staff, he had the task throughout the war of co-ordinating information about enemy air defences. He had the rank of wing commander, was appointed O.B.E. and was mentioned in despatches. On returning to Shell-Mex and B.P. he was made an assistant manager in the aviation department, his main concern being marketing to the aircraft industry, aero clubs and air racing organizations. He has become well-known as the pilot of Miles Messenger G-AKKG, in which he averages more than 300 hours a year. Shortly he is to take over a new Miles Aries. Altogether Mr. Varcoe has more than 4,000 flying hours in his log book. He is a member of the Royal Air Force Club and Royal Aero Club and is an associate of the Royal Aeronautical Society and the Guild of Air Pilots and Navigators.

M.L. Aviation Appointments

IT is announced that Mr. R. W. J. S. Parsons has been appointed to the position of chief development engineer of the M.L. Aviation Co., Ltd., of White Waltham. He joined M.L. Aviation (formerly R. Malcolm, Ltd.) in 1941, since when he has held the post of chief draughtsman. His new duties will be to introduce the firm's new products into the aircraft and armaments industries and to maintain close liaison with the Services in relation to equipment already in use.

Mr. Parsons was educated at The College, Swindon, and served his apprenticeship at the Swindon works of the Great Western Railway.

Mr. A. J. Shirley, who has been assistant chief draughtsman to the firm for many years, has been promoted to the post of chief draughtsman.

Veteran Chief Inspector's Retirement

ENDING an association with the aircraft industry that has lasted unbroken for nearly 50 years, Mr. C. W. Johns has retired at the age of 65 from the post of chief inspector of Vickers-Armstrongs (Aircraft), Ltd., Supermarine Works. He has been chief inspector for the past 26 years, and this is believed to be the longest period for which such a post has been held anywhere in the industry. As a youth, Mr. Johns worked with Howard Saunders at Brooklands in 1909, and three years later joined the Martinsyde company. He went to Supermarine in 1922. In recognition of his services to aviation, Mr. Johns was appointed M.B.E. in 1947.

Mr. Johns.

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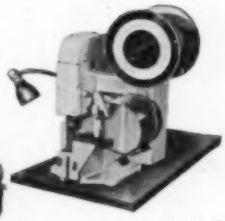

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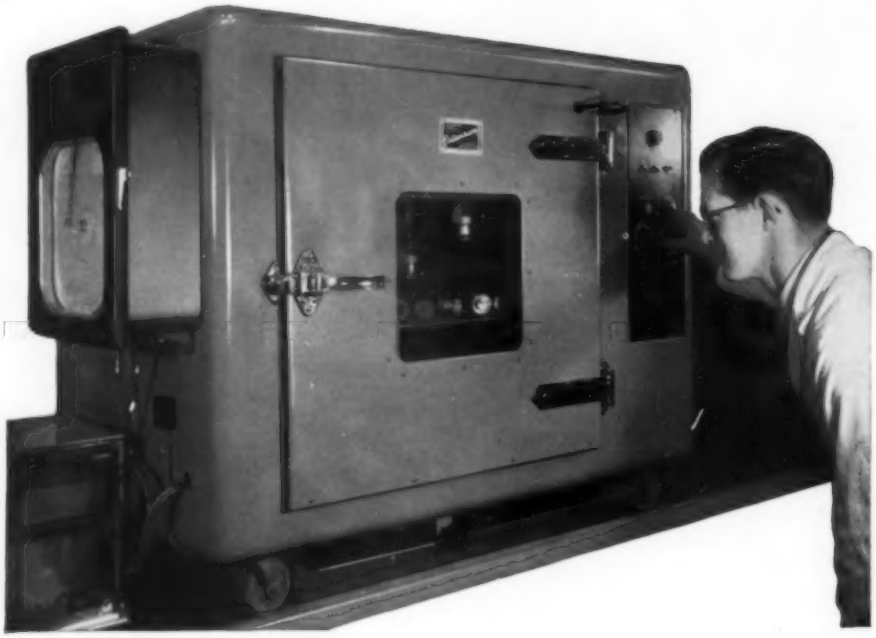

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SM29

Vickers staff at Hurn took a few minutes off last week to celebrate the rolling out of the 100th production Viscount (see next page).

CIVIL AVIATION

THE BRITANNIA'S SALES TOUR

LAST Sunday, March 18th, Bristol Britannia G-ANBE, one of the four Mk 100s now delivered to B.O.A.C., left London Airport on a sales demonstration tour of Europe. Due to return today, March 23rd, the Britannia was to undertake demonstration flights in Hamburg, Cologne, Stockholm and Copenhagen. On board were Mr. Peter Masefield, managing director of Bristol Aircraft; Dr. A. E. Russell, Bristol's chief engineer; Sir Alec Coryton, chairman and managing director of Bristol Aero Engines; Mr. W. H. Farnes, sales director of Bristol Aircraft; and Mr. J. R. Bradford, sales manager of Bristol Aero Engines.

The flight may be taken to be real evidence of the strong interest being shown in the Britannia—interest which is certain to be considerably sharpened when the first Mk 100s make their competitive presence felt when B.O.A.C. begin operations in July. The present tour will be witnessed by Lufthansa, who will be Bristol's guests at Hamburg and Cologne, and by S.A.S. at Stockholm and Copenhagen. G-ANBE will be flown by a B.O.A.C. crew and demonstrated at each city by Mr. Bill Pegg and a Bristol crew.

EASY PAYMENT CAR FERRY

FOR families or individuals buying tickets valued at £20 or more, Silver City are offering easy-payment terms on their air ferry routes to the Continent. The scheme requires a deposit of 10 per cent and an undertaking to settle the balance in monthly instalments over a period of up to 21 months, depending on the value of the tickets. The minimum period is six months. This means, for example, that a family of four, taking their car to the Continent, pay a deposit of just over £3, followed by twelve monthly payments of less than £3. The scheme applies also to the Northern Ireland and Channel Islands air ferry routes.

ELAND SALES-PROSPECTING

ALTHOUGH not ready as yet to disclose details of their world-marketing plans for the Eland, the Napier company have confirmed reports that negotiations are taking place "with American interests" for the setting up in the U.S.A. of a sales agency for the Eland. The Convair 340 which the company have engineered to take Elands has now completed the first phase of its flight tests at Luton, and as mentioned in our description of the aircraft (*Flight* for February 3rd) it is intended to demonstrate the aircraft in the U.S.A. later this year. A programme for a tour to include the main Convair 340 operators is understood to be well advanced, and the negotiations for the opening of a sales agency provide an encouraging indication of the interest which American Convair operators are showing in Napier's turboprop conversion. The company's plans for demonstrating the aircraft extend to Convair owners in Europe also. A production line for the Eland is ready to deliver and the design and engineering of Convair conversion kits is now completed.

T.C.A.'S TRIBUTE TO THE VISCOUNT

FOR the fifth successive year, records T.C.A.'s annual report, the airline had an overall annual surplus in 1955. A net surplus of £67,891 was earned during the year, and the heaviest passenger, cargo and mail loads in the company's history were carried. The report, which was presented to the Canadian House of Commons said: "Particularly satisfying was the performance of the Viscounts. Normally it can be expected that a new type of aircraft will present some operating troubles when first introduced to service. The Viscount, however, produced few such difficulties, and showed promise of giving reliable, popular, and economic service summer and winter for many years; from both the operations and traffic viewpoints they proved the ideal medium-range aircraft."

DC-3 REPLACEMENT SALES

NOW named the Safari, the F.1 four-engined high-wing DC-3 replacement designed by the Frye Corporation of Fort Worth, Texas (*Flight*, September 23rd and October 7th, 1955) has been sold to two U.S. airlines—Northern Consolidated of Alaska, and Wien Alaska Airlines. A total of six aircraft is involved, with options on a further unspecified number. "In addition," states Mr. Jack Frye, "negotiations are under way which we believe will result in enough early commitments to provide a substantial production quantity." The prototype is scheduled to fly by the end of this year, with production deliveries starting in the middle of 1957. The Frye company states that the aircraft is expected to be built in Europe, "possibly by a British manufacturer" as well as in the U.S.A., and also in Latin America.

Mr. T. H. Davis, managing director of Piedmont Airlines, U.S.A., stated in London on March 15th that his company intended to replace their DC-3s either with Handley Page Heralds or Fokker Friendships. The decision as to which type would be chosen would be made in about six months time; if the Herald were decided upon "they would spend over £1m" (indicating a total of four or five aircraft). Mr. Davis had been visiting the Handley Page and also the Rolls-Royce companies.

"Bravo Echo," the Britannia which has been on a European proving flight this week, is seen here being handed over to a B.O.A.C. crew at Bristol before delivery to London Airport. From left to right, Captain E. C. Hill; Engineer Officer C. N. Waite; Radio Officer B. E. Bone; and Mr. W. Spencer, B.O.A.C. resident projects engineer at Bristol.

After a complete overhaul by Eagle Aircraft Services, Ltd., these two Vickers Viking 1Bs, formerly belonging to their fleet, have been sold to the newly formed company Transportes Aereos da India Portuguesa. The aircraft, G-AIVB (now CR-IAD) and G-AHPP (CR-IAC) were disposed of through W. S. Shackleton, Ltd.

CIVIL AVIATION . . .

TRIPLE-CENTURY VISCOUNT SALES

AS recorded elsewhere in this issue (pages 322-324) Viscount sales have now reached the 300 mark. An announcement by the Persian Government in Teheran on March 12th stated that three Viscounts (type unspecified) are being bought for military transport duties. Although not officially confirmed by Vickers at the time this issue went to press, this order brings the total number of Viscounts sold to 301: they have been ordered at a rate of one every other day since the beginning of December. Appropriately, the 100th machine off the production line, the fifteenth 745 for Capital Airlines, was handed over to the customer a few days later.

A tribute paid by Trans-Canada Air Lines to the performance of its Viscounts appears in a news item on the previous page.

B.E.A. CONTRACT WITH B.P.

FOR the next three years all of B.E.A.'s fuel requirements will be met by the British Petroleum Company. The contract, which was the result of a competitive tender, covers some 60 airports in the United Kingdom and abroad, and is stated to be valued at more than £8m. With effect from April 1st it calls for the supply of some 400,000 tons of aviation fuel, the majority of it aviation kerosine.

B.O.A.C. AND B.E.A. MAKE THEIR OWN WAY

IT was known last January that the Government were to review the Exchequer's power to make grants to the Corporations, in view of the fact that both are now operating at a profit. (B.O.A.C. have received no grant since 1951; a grant of £1m was made to B.E.A. during the financial year ended March 31st 1955). It was considered possible (*Flight*, January 6th) that legislation would be introduced to maintain the Exchequer's power—due to lapse at the end of this month—to make grants in an emergency. That this is not considered necessary is evident from the Civil Aviation Estimates, published on March 13th, in which no provision is made for the making of further grants. The new Estimates show a net decrease of £1,085,010.

BREVITIES

THE entire K.L.M. fleet of 14 Convair 340s has been brought up to Convair 440 Metropolitan standard. The modifications, carried out during the past few months, include improved soundproofing and increased power (P. and W. R-2800 CB17 engines). K.L.M. have also converted four Lockheed 1049E Super Constellations to Super-G standard.

* * *

In view of the political situation, B.E.A. services to Athens were temporarily discontinued last week on the advice of the Foreign Office.

* * *

The first Viscount for the Venezuelan airline L.A.V. was recently delivered to Caracas. Two more aircraft will be delivered shortly.

* * *

Washington Radio reported on March 8th that Lufthansa has decided to buy four Boeing 707s. The German airline has already stated its intention to buy either the DC-8 or the 707.

* * *

The Soviet Government is stated to be interested in the S.E. Caravelle and to be considering sending a delegation to France to study the possible application of the aircraft to Aeroflot's routes.

* * *

The anniversary of the first flight from England to South Africa in 1920 was commemorated by the unveiling of a memorial by Sir Miles Thomas at Jan Smuts Airport in Johannesburg on March 20th. The two pilots of the pioneer flight, Sir Pierre van Ryneveld and Sir Quintin Brand, were present at the ceremony.

* * *

The composition of United Airlines DC-8 fleet will be fifteen aircraft with J57s and fifteen with J75s.

* * *

The I.A.T.A. European Traffic Conference, originally scheduled for September, has been put forward to May 29th. The venue has not yet been announced.

* * *

Plans are being considered by the M.T.C.A. for a new lounge at London Airport, to be used by the Royal Family and by State visitors.

* * *

The summer schedules announced by B.O.A.C. include 27 return flights per week on the Stratocruiser Atlantic services—18 to the U.S.A., seven to Canada, and two to the Caribbean.

* * *

The DC-8 will be fitted with an integrated flight instrument system developed by the Kollsman Instrument Corporation of New York.

* * *

The ban on overtime by B.E.A. and B.O.A.C. engineers, whose pay claim for a 15 per cent increase was recently rejected, continued last week. Up to March 16th no serious dislocation of services had been experienced.

* * *

On April 18th B.W.I.A. will open a twice-weekly Viscount service from New York to Nassau and on to Jamaica. From November, the start of the winter holiday season, frequencies between New York and Nassau will be stepped up to one service a day.

This "Flight" photograph, taken recently at Nice, shows the progress made with the fine new airport buildings there.

Following the tricycle Cessna 172 introduced a few months ago, the model 182 illustrated is now on the American market, powered by a 230 h.p. Continental engine. Cruising speed at 70 per cent power and 7,500ft is said to be over 150 m.p.h.

CLUB AND GLIDING NEWS

BAD news recently is that the Scottish Flying Club at Renfrew is to close down next month, because of an increase in rent and rates charged by the Ministry of Transport and Civil Aviation. Flying hours have already decreased, the club reports, due to restrictions placed on club flying. These restrictions include the imposition of strict weather minima for club operation, and of fixed time intervals between scheduled-service aircraft movements and club flights. A considerable amount of money was needed, the club points out, to install radio in club aircraft to meet M.T.C.A. requirements when permission was given to operate again at Renfrew in 1952.

Unfortunately the existing clubroom accommodation is not large enough to hold social functions which could attract new members. The splendid clubhouse built by the Scottish Flying Club in 1934 at a cost of over £6,000 was requisitioned on the outbreak of war in 1939 and, states the club, no compensation has been paid. When B.E.A. moved from this accommodation, which they had occupied since 1946, to the new terminal building, the club received an offer to rent their own building for the sum of £2,000 per annum. The offer was not accepted.

When the club ceases operations at Renfrew there will be no remaining light-aircraft flying training facilities in the west of Scotland. All members of the Renfrew club are to transfer to a new club, which is to operate at Scone Aerodrome, Perth. It is still hoped that the Scottish Flying Club may one day become active again.

THE Channel Islands Aero Club (Jersey) will hold its 3rd International Air Rally from Saturday, May 12th, to Monday, May 14th. It is expected that there will be a larger number of entries than last year, when some 50 aircraft took part. Competitors will be accommodated at the Portelet Hotel, St. Brelades. Coach tours, social functions and competitions are being organized. Because of limited accommodation, early application is advisable: further details and entry forms from the Secretary, Channel Islands Aero Club, Clubhouse, Jersey Airport.

FLYING competitions currently organized by the Lancashire Aero Club include the Crossley Navigation Competition, open until April 28th; and the Rodman and Pemberton Landing Competitions, which are to be held on that date. A total of 120 members and guests attended the club's annual supper dance last month, which, it is reported, was a great success. The club's future plans include the employment of another full-time instructor, purchase of another aircraft, provision of a Link trainer, and extensions of the existing clubroom accommodation to provide a separate large lecture room, a television room, a larger kitchen and a dance/dining room. February flying hours numbered 57.

YORKSHIRE Aeroplane Club's "At Home" this year will be on Sunday, July 22nd. A prize is being offered at the club tonight (March 23rd) for the best line-shoot of the evening at the annual Pilots' Supper.

FEBRUARY'S flying time at the Fair Oaks Aero Club totalled 182½ hr—a record for any February since the formation of the club in 1946. Because of the rising cost of spares and the recent wage increase in the engineering trades, the club has reluctantly decided to raise its flying rates to £4 per hour (dual) and £3 10s per hour (solo) for Tiger Moth and Auster aircraft.

SCHOOL flying time logged by the Wiltshire School of Flying at Thruxton during 1955 amounted to 3,583 hours. The formation of the Thruxton Ultra-light Flying Group took place in December, with the co-operation of the Popular Flying Association: this group is now operating Dart Kitten G-AMJP at a flying rate of £2 5s per hour.

LONDON Gliding Club at Dunstable are planning rallies over the Easter and Whitsun weekends, and a competition week for members during July. The staff now includes R. Stafford-Allen, manager; Noel Quinn, ground engineer; and John Everitt, instructor. Useful weather gen is now constantly available from C. E. Wallington, of the Met. Office forecasting station at Dunstable, who resides on the site in his caravan. A new club prize is to be awarded for the best out-and-return flight during the year. Two Slingsby T.21Bs are now used for dual training, the prototype T.21A "barge" being available for the use of club pilots with a minimum of 50 hours and a "C" certificate. Delivery of the club's Skylark II is expected in May.

DETAILS of 1956 summer gliding courses, recently announced by the British Gliding Association, are as follows:

Derby and Lancs G.C., Camphill, Derbyshire (enquiries to R. Mills, 27 Heath Road, Stockport): June 10th-16th, 17th-23rd; July 1st-7th, 8th-14th, 22nd-28th; July 29-August 4th; August 19th-25th; August 26th-September 1st; September 2nd-8th. Price: 12½ guineas.

London G.C., Dunstable, Beds (course secretary, London Gliding Club, Dunstable): May 7th-12th; May 28th-June 2nd; June 11th-16th; June 25th-July 7th; July 16th-28th; August 13th-25th; September 3rd-15th, 24th-29th; October 1st-6th. Price: £14, £24 and £26.

Midland G.C., Long Mynd, Shropshire (J. W. C. Harden, 37 Hugh Road, Smethwick 41, Birmingham): June 9th-16th; June 30th-July 11th; August 11th-18th; September 8th-15th. Price 17 guineas.

Bristol G.C., Nympsfield (J. B. Daniell, 63 Sefton Park Road, St. Andrews, Bristol 6): Weekly from June 4th to September 28th, excluding August 6th-11th. Price: 12, 13 and 14 guineas.

Scottish Gliding Union, Balado, Kinross-shire (course secretary, S.G.U., Balado, Nr. Milnathort): April 7th-14th; June 30th-July 7th; July 14th-21st; July 28th-August 4th; August 11th-18th; August 25th-September 1st. Price £14.

Surrey G.C., Lasham, Hampshire (A. F. Gotch, Surrey G.C., Lasham Aerodrome, Nr. Alton): April 29th-May 5th; May 6th-12th, 13th-19th; May 27th-June 2nd, June 3rd-9th, 10th-16th, 17th-23rd; July 1st-7th, 15th-21st; September 2nd-8th, 9th-15th, 16th-22nd, 23rd-29th. Price: 18 guineas. Also winter courses, price 12 guineas.

Yorkshire G.C., Sutton Bank (course secretary, Yorkshire G.C., Sutton Bank, Thirsk, N. Yorkshire): June 17th-23rd; July 1st-7th, 15th-21st; July 29th-August 4th, August 12th-18th; August 26th-September 1st, September 9th-15th. Price, 14 guineas.

APPLICATION by the newly-born Perkins Gliding Club, Peterborough, to use Westwood Aerodrome has been refused. The club (for employees of F. Perkins, Ltd., the diesel engine company) had been negotiating with the Air Ministry, M.o.S., and Ministry of Agriculture for flying facilities on the aerodrome; it is now understood that priority is to be given for the land to be used for agriculture. The possibility of using either Polebrook, an ex-R.A.F. airfield some nine miles from Peterborough, or large fields within a five-mile radius of the city is now being investigated.

CHAMPION Canadian glider pilot for 1955 is Frank Brame, of Toronto, who was awarded the Canadair Trophy of the National Soaring Association of Canada earlier this month. The trophy was awarded on the basis of Brame's five best flights during last year—209 miles from Regina, Saskatoon, to Minto, N. Dakota; 165 miles from Regina to Gainsborough, Saskatoon; 57 miles from Brantford to Orangeville, Ontario; 47 miles from Brantford to Brampton; and 42 miles from Brantford to Dunnville. From 1950 to 1952, when in this country and studying at Cranfield, Brame was a member of the College of Aeronautics Gliding Club.

WOLF HIRTH, the pioneer German sailplane pilot and constructor, hopes to bring two new sailplanes (designed for cheapness and using plastics extensively) to St. Yan in July next. They are of 12 metre and 16 metre span respectively, and the smaller has an empty weight of only 165 lb. These sailplanes will not take part in the world championships, but will be available for the comparison flight-tests which OSTIV hope to organize immediately after the championships.

The first Blackburn Beverley C.1 (four Bristol Centaurus) for Transport Command leaving Brough on March 12th, on its delivery flight. The pilot was S/L. A. St. J. Price. As recorded elsewhere in this issue, the Duke of Edinburgh is to inspect Beverley production on April 6th.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

Senior Appointments

THE following appointments of Royal Air Force senior officers have recently been announced:—

A.V-M. H. A. Constantine is to succeed Air Marshal Sir Walter Dawson as Deputy Chief of Staff (Plans and Operations) at SHAPE. The appointment will take effect in May, when A. V-M. Constantine will receive the acting rank of air marshal. An announcement about Air Marshal Dawson's new appointment will be made later. Since August 1954 A. V-M. Constantine, who is 47, has been Commander of No. 25 Group, Flying Training Command. For a time after the war he was Chief Intelligence Officer at the Headquarters of B.A.F.O. in Germany. He was Director of Intelligence at the Air Ministry from 1951 to 1952, and then became Air Officer in Charge of Administration at Fighter Command. When promoted to air vice-marshal at 36 he was one of the youngest men to reach such high rank.

A. Cdre G. A. Walker is to be Air Officer Commanding, No. 1 Group, Bomber Command, with the acting rank of air vice-marshal, in May 1956. Since February 1954, as Commandant of the R.A.F. Flying College, Manby, he has led his staff and students on numerous long-range exercises. In July 1954 he led two Hastings over the North Geographic Pole on survey flights from Bodö, Norway. At the outbreak of the war he was on armament duties at the Air Ministry and joined No. 16 O.T.U. as a staff pilot in June 1940. Taking command of No. 50 (Bomber) Squadron in October 1940, he led many raids over Europe, and in 1941 was awarded the D.S.O. and the D.F.C. From 1941 to 1945 he commanded bomber stations at North Luffenham, Rutland, and Syerston, Notts, and the bomber base at Pocklington, Yorks. At Syerston he lost his right arm in an explosion when attempting to rescue the crew of a crashed aircraft. In February 1945 he was appointed S.A.S.O., No. 4 Group, and subsequently was in the Directorate of Training Operations and S.A.S.O. of the Rhodesian Air Training Wing. In 1952 he commanded R.A.F. Coningsby, Lincs, and took the Imperial Defence College 1953 course.

Director of the W.R.A.F.

THE Air Ministry announces that the Secretary of State for Air has approved the appointment of Group Officer Mary Elizabeth Barnett, C.B.E., as Director of the Women's Royal Air Force, with the acting rank of Air Commandant, in succession to Air Commandant Dame Nancy Marion Salmon, D.B.E., A.D.C., who will be retiring from the Force. The appointment will take effect later this year.

G/O. Barnett has been Officer Commanding R.A.F. Hawkinge, Kent, where the Women's Royal Air Force Officer Cadet Training Unit is based, since November 1st, 1952. She joined No. 45 (County of Oxford) A.T.S. Company in 1938 and was jointly responsible for the company's formation. Transferring to the Women's Auxiliary Air Force on its formation in June, 1939, she served as Officer in Charge of W.A.A.F. at Upper Heyford, Oxon, and Feltwell, Norfolk. In January 1941 she was posted to Air Ministry Unit, London. As a wing officer she went in 1945 to H.Q. Mediterranean and Middle East Commands, where in her capacity as W.A.A.F. Staff Officer she travelled extensively in North Africa, Italy, Malta, Greece and Austria, visiting W.A.A.F. units. On her return to the United Kingdom in October 1947 she was appointed W.A.A.F. Staff Officer at H.Q., Flying Training Command, before being promoted group officer and becoming Inspector of the W.A.A.F. in October 1948. From February 1949 until June 1950 she was Deputy Director, Women's Royal Air Force, dealing with the selection, promotion, career and personal problems of W.R.A.F. Officers. Then for two and a half years she was W.R.A.F. Staff Officer at H.Q. Home Command. She was appointed O.B.E. in the New Year Honours of 1950 and C.B.E. in the New Year Honours of 1956.

G/O. M. E. Barnett, C.B.E., newly appointed director of the Women's Royal Air Force.

Hull U.A.S. Dines

PROMINENT on the top table at the Hull University Air Squadron's annual dinner—held at the New York Hotel, Hull, on March 6th—was the Read Trophy, the winning of which was the squadron's outstanding achievement of the year. (First, second and fourth places were gained in the flying competition with the universities of Leeds, Nottingham, and Durham.)

At the dinner the new commanding officer, S/L. P. Dawes, who has just returned from an exchange posting with the U.S. Navy, was host to the Lord Mayor of Leeds, Alderman W. Fox, J.P.; to the Vice-Chancellor of Hull University, Dr. J. H. Nicholson; and to Mr. E. Turner, chairman and managing director of Blackburn and General Aircraft, who maintain the squadron's five Chipmunks and one Harvard at Brough. The Mayor recalled the founding of the university in 1927 and, as the first citizen of Hull, stressed the importance of the close links that existed between "town and gown." Mr. Turner, for Blackburns, illustrated with a story the mutual feeling between his company and the university—but pointed out that no university could fully serve the national interest without a chair of engineering.

The trophy for the best cadet of the year went to P/O. (acting) T. Hannath.

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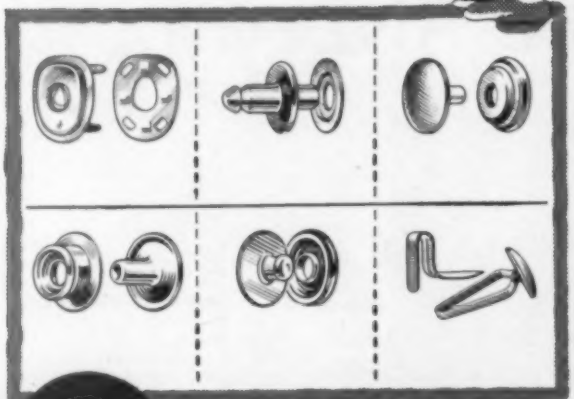

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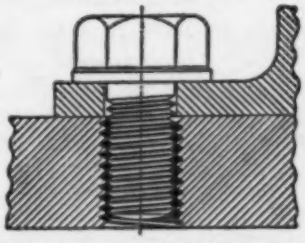

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APPLICATION No. 742. From Dan-Air Services, Ltd., of Bilbao House, 36/38 New Broad Street, London, E.C.2, for a Seasonal Inclusive Tour Service with Dakota aircraft in conjunction with Sky Tourist Services, Ltd., for the carriage of passengers and supplementary freight between London (Blackbushe) and Barcelona at a frequency of one return flight fortnightly to be operated on Fridays during the period from 8th June to 14th September, 1956 inclusive.

APPLICATION No. 60/2. From Manx Airlines, Ltd., of Ronaldsway Airport, Isle of Man, for permission to operate Bristol 170 aircraft in addition to types of aircraft already approved on the Internal Services which the Company have been authorised to operate on the following routes:

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THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on 30th July, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [5005

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DESIGN AND DETAIL DRAUGHTSMEN

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(l) Draughtsmen (senior, intermediate and junior) for the design of electrical and radio systems, instruments, structures, power plants, installations, mechanism, furnishing, etc. Aircraft experience not essential.
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VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED,

WEYBRIDGE, SURREY,

Require:

(q) Senior Design Draughtsman for the design of aircraft alighting gear, etc. Good prospects for an experienced specialist, and opportunities to exercise originality and skill in design.

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SALARIES will be paid according to qualifications and experience. Applications should be made in strict confidence to:

PERSONNEL Manager, Eagle Aircraft Services Limited, Blackbushe Airport, Camberley, Surrey. Telephone: Yateley 2371. [4976

STRESSMEN, senior and junior, required for interesting project work with progressive aircraft firm on south coast. Apply in writing to F. G. Miles, Ltd., Shoreham Airport, Sussex. [5012

TEST and Laboratory Engineers required for gyro and electro mechanical instruments. Apply stating age, experience and salary required to S. G. Brown, Ltd., Shakespeare Street, Watford, Herts. [0147

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WORKS Chemist. A company manufacturing from synthetic rubber, plastics and glass laminates, requires a first class practical chemist with honours degree or equivalent, experienced in laboratory organization and with a flair for diagnosing project development problems. Contributory pension scheme. Write stating qualifications, experience, age and salary. Box 0794. [4997

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TECHNICAL Publications Department of light engineering company in S.W. Middlesex require technical illustrators and technical authors. For the latter, ex-R.A.F. or R.N. personnel with considerable experience in workshop overhaul of aircraft components will be considered. Write stating experience, age and expected salary to Box No. 0759. [5013

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TECHNICAL Clerk (B.I.S.), of reasonable educational level with an aptitude towards engineering. Must be capable of understanding assembly schedules and able to read drawings. Duties will include the compilation of technical build instruction sheets for assembly and test work. Training will be given to suitable candidate.
PLEASE write in detail, quoting Ref. 100, to:—The Personnel Manager (Technical Employment), de Havilland Propellers Limited, Hatfield, Herts. [4979

KING AIRCRAFT CORPORATION require Senior, Intermediate and Junior Draughtsmen, and Stress Engineers, at their Central Glasgow Design Offices for work on an expanding programme of interesting and important projects of an advanced nature. Good salaries and conditions, forward details of previous experience to:—Personnel Officer, King Aircraft Corporation, Hillington, Glasgow, S.W.2. [0422

SCOTTISH AVIATION have immediate vacancies for aircraft stressmen and aerodynamicists for work on the Prestwick and Twin Pioneer aircraft. Excellent prospects for experienced men. New houses are also immediately available. Applicants should reply in writing giving details of experience and training to the Personnel Manager, Scottish Aviation Limited, Prestwick Airport, Ayrshire. [4911

SCOTTISH AVIATION urgently require Planning Engineers for work on their Prestwick Twin Pioneer project. Applicants should have served a recognised Engineering Apprenticeship and have previous Aircraft Planning experience. Houses immediately available. Reply giving details of training and experience to Personnel Manager, Scottish Aviation, Ltd., Prestwick Airport, Ayrshire. [4858

REQUIRED for Rapide operators Middle East two years contract, single men preferred, two Rapide captains, senior commercial pilot licences and instrument ratings. Salary U.S. $600 per month plus living allowance. Also two licensed engineers with B, C and X licences. Salary U.S. $400 per month plus living allowance. Apply in writing with full particulars to Blanford and Houdret, Ltd., Leadenhall House, 101 Leadenhall Street, London, E.C.3. [4920

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STRESSMEN in all grades required. Salaries range from £500 p.a. to £1,100 p.a. Qualifications required: H.N.C., Certificate of Education (Advanced Level), B.Sc. Engineering, Mathematics or Physics. Previous experience not essential but will be taken into account when fixing salary. Application forms from Chief Stressman, Electro-Hydraulics Limited, Liverpool Road, Warrington, Lancs. [4956

SENIOR qualified development engineers and technicians required in research department of a well-known firm of precision engineers, particularly for work in connection with Servo systems, small precision motors and gyroscopic control systems. Apply stating age, qualifications, experience, and salary required to S. G. Brown, Ltd., Shakespeare Street, Watford, Herts. [0146

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PILOTS required by Associated British Airlines for service with Iraqi Airways, Baghdad, Captain A.L.T.P. Group I Vikings; First Officer S. or C.P.L. Group II Vikings and I.R. Possible later conversion to Viscount at company expense. BALPA rates with generous allowances, accommodation and no income tax. Apply Staff Manager, A.B.A. (ME), Ltd., Stratton House, Stratton Street, London, W.1. [4984

AERODYNAMICIST required for our London Office. Candidates should be 24-28 years of age, with a good degree and some experience of supersonics. Duties will be of a varied nature, including thermodynamic work and liaison with Trials teams. Please write in detail, quoting Ref. 118, to:—The Personnel Manager (Technical Employment), de Havilland Propellers Limited, Hatfield, Herts. [4978

TECHNICAL Artists required for Publications Department. An interesting and varied work programme calls for ability to produce first-class perspectives in line and half-tone from blue-prints and personal investigation. Working conditions are excellent, and surroundings congenial. Apply giving particulars of age, experience, salary required and quoting Ref. F.78 to the Personnel Officer, Saunders-Roe, Limited, East Cowes, Isle of Wight. [5014

TECHNICAL Author required immediately for Publications Dept. Adequate engineering background with ability to write good and concise English essential. Ex R.A.F. Personnel concerned with the preparation of Servicing Schedules and related publications would be particularly suitable. Apply giving particulars of age, experience, salary required and quoting Ref. F.77 to the Personnel Officer, Saunders-Roe, Limited, East Cowes, Isle of Wight. [5015

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ARMSTRONG SIDDELEY has a vacancy for a flight test observer in connection with flight testing gas turbine engines. Applicants should have a Degree or equivalent in either Mech. or Aeronautical Engineering. Previous flying experience not necessary. Selected applicants will be required to undergo a medical examination. Good salary offered dependent on age, experience and qualifications. Applications to Reference FL/T, Armstrong Siddeley Motors, Coventry. [0463

ARMSTRONG SIDDELEY MOTORS have a vacancy for an Honours Degree mathematician in an expanding section, using electronic calculating machines for the solution of all types of problems associated with the development of gas turbine aero engines. Experience is not necessary but would be taken into account in fixing the initial salary. Applications with full details should be submitted to Reference DRE, Technical Personnel Officer, Armstrong Siddeley Motors, Coventry. [0460

A. V. ROE & COMPANY, LIMITED, require a radio operator for air crew duties on flight test work at Woodford Aerodrome, Cheshire. Applicants should possess a current P.M.G. radio operator's licence and should be interested in the installation of various types of radio facilities fitted in the present-day aircraft. Write, giving full particulars of previous experience, age, etc., to the Personnel Manager, A. V. Roe and Co., Limited, Greengate, Middleton, Manchester. [4943

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SCOTTISH AVIATION urgently require Draughtsmen and Designers for work on their Prestwick Twin Pioneer and other new projects. Applicants should have served a recognised Engineering Apprenticeship and have previous experience in the Aircraft Industry. Excellent conditions and pension scheme in operation. Houses immediately available. Reply giving details of training and experience to Personnel Manager, Scottish Aviation, Limited, Prestwick Airport, Ayrshire. [4859

YOUNG Engineers required by Armstrong Siddeley Motors for work on gas turbine aero engine performance prediction, flight analysis and associated problems connected with the flight development of engines. Degree, or equivalent required, a mathematical bias an advantage. Previous experience of this type of work desirable but not essential. Good salaries and pension scheme. Applications, with full details of age, experience and qualifications to Reference FL/P, Technical Personnel Manager, Armstrong Siddeley, Coventry. [0471

HANDLEY PAGE (READING), LIMITED, The Aerodrome, Woodley, Reading, Berks, have vacancies for Senior Stressmen for interesting work on Civil Aircraft. High commencing salaries will be paid and new houses to rent will be offered to successful applicants. Also required are Senior and Intermediate Design Draughtsmen and Weights Engineers. Superannuation and Life Assurance Scheme is in operation for all staff employees. Please send full particulars of experience, etc., to the Personnel Officer. [0280

TECHNICAL Authors (Senior, Junior and Intermediate), must be capable of reading engineering drawings. Duties will include the preparation of descriptive and instructional literature on a wide range of subjects—mainly mechanical and hydraulic. Knowledge of methods of print production and associated processes an advantage. Instruction given in Junior post which is intended to be progressive. Please write in detail, quoting reference number 19, to:—The Personnel Manager (Technical Employment), de Havilland Propellers, Ltd., Manor Road, Hatfield, Herts. [0421

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Assistance with housing and with removal expenses.

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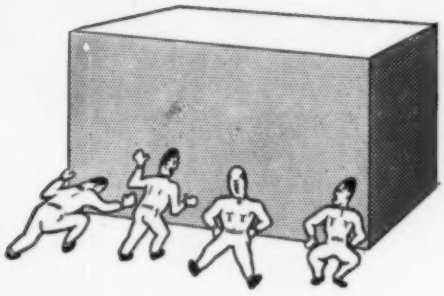

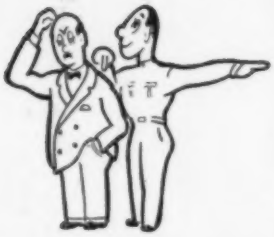

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